

AVIATION WEEK

A MCGRAW-HILL PUBLICATION

JUNE 29, 1953

50 CENTS

A MOST-IMPORTANT MAP TODAY

Time was when the Mercator projection was *the* map.

But today, with the importance of polar routes and great circle flight plans, the polar projection has become a most-important map.

And the map you see here is important for another reason, too: it shows the scope of the Honeywell Field Service organization. Carefully selected Service Engineers are stationed around the world, as indicated.

Their job is to service and flight-test Honeywell controls—Autopilots, Engine Controls, Electronic Fuel Gauges, Gyros and other control equipment—in dozens of different kinds of aircraft, wherever they fly. And their job, too, is to help train Air Force, Navy and airline crews in maintenance of their control equipment, as well as to recommend design changes and figure new ways to meet new control problems.

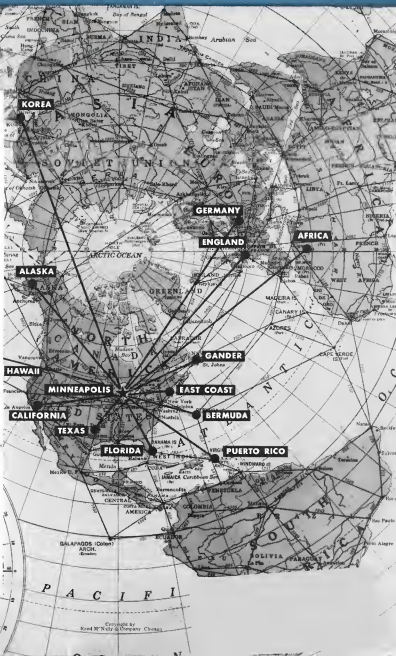
We expect our staff of Service Engineers to grow larger in future years. Because *automatic control* is so important a part of aviation progress. And *automatic control* is Honeywell's business.

MINNEAPOLIS
Honeywell



Aeronautical Controls

2600 Ridgway Rd., Minneapolis 13, Minn.



Every flight, every landing,
every transport is
Hydro-Aire equipped.

How to stop on a dime...

...and save a dollar!

The Hytrol Anti-Skid Braking System stops you on the money!

Safe, sure, skidless stops, even on icy runways, mean more completed scheduled flights. That's money in the bank! But for even greater financial advantages consider the Hytrol airline record of cash savings on tires and brake linings. Day after day Hytrol, by eliminating skidding, flat spots and blow-outs is making phenomenal savings on tire replacement and retreading. Tire changes due to flat spots have been eliminated completely. And because of the braking action, Hytrol is reducing brake lining costs by more than 35%.

Yes, Hytrol Anti-Skid Braking System, developed for greater safety and control in landing, has proved to have an important additional asset—a dollar and cents value that permanently reflects in operation economy.

SEND FOR THE COMPLETE
hytrol STORE

HYDRO-AIRE Inc.
BURBANK, CALIFORNIA
Solebury of Crane Co.

B.F. Goodrich



How B. F. Goodrich makes it hot for ice

SUPPORTING air protection for any size or shape of airplane is no longer a problem for B. F. Goodrich engineers. With flexible electric rubber, they can get a skin tight fit over bulges, around tricky curves and corners.

A. B. F. Goodrich development, electric rubber can be made only one-tenth of an inch thick. In case of electrical resistance wires applied heat so intense that water droplets leaving will evaporate before they freeze. It is the most efficient method of supplying heat, and using heat in simplifies design, saves weight, can be converted on 24 hours basis power so operators need not worry carry the electricity furnished by the plane's regular power supply.

Electric rubber—where BFG's electric rubber has given successful ice protection. On prop planes, it prevents ice from cutting down a plane's speed and maneuverability.

In a jet engine's intake, it stops ice from choking off engine air, vital for combustion.

In air wings, it insures plentiful air supply for cabin heating systems and for cooling engine accessories.

On radio masts, it keeps ice from forming and causing them to snap off in the wind.

On elevator horns, it keeps them from freezing tight, insures easy control.

B. F. Goodrich electric rubber is also used on wings, hydraulic lines, water tanks, spacers, doors, jet engine doors and many other airplane parts. It's a typical development of BFG's engineering and research for aviation. Other B. F. Goodrich aviation products include tires, wheels and brakes; De-Kort, Pressure Sealing Zippers, Avionics, inflatable seats, thrust lock actuators, fuel cells, fuses, antennas. The B. F. Goodrich Company, Akron, Ohio Division, Akron, Ohio.

B.F. Goodrich
FIRST IN RUBBER

LEWIS

Industries Promoters

for temperature testing
in the laboratory
or in the plant...

Connected with the same case as our standard temperature indicators, these promoters bring "accurate quality" to the test engineer.



MODEL 1077, above, has been used extensively for test testing on the "Proving Grounds" for motor manufacturers. Shown as an automatic indicator unit, has a fixed range scale and is fully compensated for ambient temperature. Model is rugged, built-in, with suitable thermocouple materials.



MODEL 1078, left above, has same type construction as Model 1077, except it is mounted in a panel. Model 1079, right above, has same type construction as Model 1077, except it is mounted in a panel.

MODEL 1077, left above, has same type construction as Model 1077, except it is mounted in a panel. Model 1079, right above, has same type construction as Model 1077, except it is mounted in a panel.

STANDARD RANGE—All Models
TEMPERATURE
Scale in 100, 200, 300, 400, 500, 600, 700, 800, 900, 1000, 1100, 1200, 1300, 1400, 1500, 1600, 1700, 1800, 1900, 2000, 2100, 2200, 2300, 2400, 2500, 2600, 2700, 2800, 2900, 3000, 3100, 3200, 3300, 3400, 3500, 3600, 3700, 3800, 3900, 4000, 4100, 4200, 4300, 4400, 4500, 4600, 4700, 4800, 4900, 5000, 5100, 5200, 5300, 5400, 5500, 5600, 5700, 5800, 5900, 6000, 6100, 6200, 6300, 6400, 6500, 6600, 6700, 6800, 6900, 7000, 7100, 7200, 7300, 7400, 7500, 7600, 7700, 7800, 7900, 8000, 8100, 8200, 8300, 8400, 8500, 8600, 8700, 8800, 8900, 9000, 9100, 9200, 9300, 9400, 9500, 9600, 9700, 9800, 9900, 10000, 10100, 10200, 10300, 10400, 10500, 10600, 10700, 10800, 10900, 11000, 11100, 11200, 11300, 11400, 11500, 11600, 11700, 11800, 11900, 12000, 12100, 12200, 12300, 12400, 12500, 12600, 12700, 12800, 12900, 13000, 13100, 13200, 13300, 13400, 13500, 13600, 13700, 13800, 13900, 14000, 14100, 14200, 14300, 14400, 14500, 14600, 14700, 14800, 14900, 15000, 15100, 15200, 15300, 15400, 15500, 15600, 15700, 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How many quarts for a 1-TON BABY?*

*SHELL AIR FACTS

**Air transportation
is efficient:**

**A ton of freight—be it
elephants or eggs—flies
a distance of one mile
on less than 1/4 of a
quart of aviation fuel.**



SHELL OIL COMPANY

40 WEST 30TH STREET, NEW YORK 26, NEW YORK
100 BUN STREET, SAN FRANCISCO 9, CALIFORNIA

Domestic

Republic Aviation Corp. last week awarded Saccus (nationalized Finnish aircraft manufacturer) a more than \$10-million contract for seven jets for NATO's new F-4H jet fighters, scheduled to begin arriving in Europe next fall. Contract is the largest claim of a \$10-million order placed recently by USAF with the company's Swiss subsidiary, Republic Aviation (Helveticum), for Thunderbolt jets. The remaining funds are expected to be broken up into smaller contracts to European manufacturers that produce parts not made in Swiss.

New cancellation of orders for 30 Perceps HRP helicopters will not result in layoff of production workers, company president Don Butler said last week. The Martins, Pa., center has plans to increase production of some models; start new projects and build more parts now subcontracted to other companies.

Quads settlement totaling \$300,000 has been paid by National Airlines to an Elizabeth, N. J., couple who suffered severe burns when an NAL DC-6 plunged into an apartment house Feb. 11, 1957, shattering their third-floor dwelling with flaming gasoline. Metropolitan, Federal Judge A. E. Morduch has ruled in favor of four other sportscar deaths sinking fuel of other claims stemming from the crash, clearing the way for lawsuits on 28 other vital pending.

Fuelt & Whelan Aircraft announced last week it is beginning helicopter production of TH-1A daycruiser engines and is offering a conventional version rated at 5,600 hp to U. S. and foreign airlines.

An Transport Area forecasts multi-engine helicopters capable of carrying 50 to 60 passengers will be ready for scheduled operation by 1959-60, says general aviation study of an ATA test program designed to compile data on effective cockpit configurations with surface transport in the shortland aircraft market.

Rex Adam Apollo Sorek has been named chief of Navy's Bureau of Aeronautics for a four-year term to succeed Rex A. Thomas S. Goble, who has been accommodated for personnel to vice admiral in command of a designated fleet.



New Fletcher Tested

Latest model of the Fletcher Delco biplane plane, the FD 25 R, is now taking off for the first time at Whittier Air Park, San Francisco, Calif. Major change from previous FD 25 model is a telescopic extension in place of wing.

Full-scale replica of the Wright biplane plane that made the first powered flight 50 years ago has been completed by the Institute of the Aeronautical Sciences and 24 U. S. aircraft companies and will be displayed at the NAS annual summer meeting dinner July 31 at Los Angeles.

Old cockpit planes are sought by Wright Patterson AFB, which wants to become these fighters and bombers for a parade of military aviation progress Sept. 5-7 at the National Aircraft Show, Dayton, Mass. Aircraft: A-1, P-6, P-13, P-38, P-51, P-58, P-59, P-61, B-5, B-10, B-15, B-25, A-29 and B-29.

Buend International Airways marked its 25th anniversary June 10.

Five aircraft companies reported 56 lightplanes valued at a total of \$179,779 last week, upping 1957 foreign shipments to 135 units at \$1,437,027, Air Corps Industries, Ames reports. Companies reporting May exports: Beech, Cessna, Piper and Taylorcraft.

Luckland Aircraft Service completed conversion this month at LAS Burbank, Calif., of eight Trips World Aircraft Conversions to 81-seat tourist configuration.

Airline executive workshop will be launched July 23 for a five-week summer program at the University of Colorado, Boulder, under joint sponsorship of Civil Air Patrol and CU.

Pan American World Airways is launching approximately 50 jet pilots of PAA's total pilot roster of 1,940.

airman midway. The director also has been awarded flights and helms and more efficient radio gear is needed. First public showing of the new Fletcher FD 25 R will be at the National Air Show to be held at Dayton, Ohio, Sept. 5-7.

New \$6-million terminal and other improvements at Miami International Airport are scheduled for start of construction this fall.

Financial

North American Aviation, Inc., Los Angeles, has declared a dividend of 75 cents per share, bringing total payments for the current fiscal year to \$1.50 on 3,415,833 shares of stock outstanding.

Northwest Orient Airlines has declared a regular quarterly dividend of 20¢ per share of 4-6% cumulative preference stock.

International

Panair do Brasil Constellation crashed and burned June 17 during a landing approach to Sao Paulo, Brazil Airport, killing 10 passengers and seven crewmen.

Thirty-three persons were killed in the crash of an Air Laos Co. DC-3 June 17 in the jungle near Vientiane, Laos.

Av Vax Masch Thomas G. Pike, former deputy chief of staff at Headquarters, Allied Air Forces Central Europe, has been named assistant chief of the air staff of the Royal Air Force.

Airline traffic transactions put through the International Air Transport Association board in London totaled \$17,714,000 last April, an increase of \$24,000 over turnover registered during the same month of 1955, IATA reports.

RIBBORNE
is proud that
these Companies
are among
its many customers



NORTH AMERICAN RELATIONS, INC.



Production quantities of our accessories have been delivered to these well known companies during the past year. To such leaders we owe our continued growth.

RIBBORNE
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1414 Chestnut Avenue
Hillside 5, New Jersey

The Aviation Week

June 29, 1953

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N.W. LERJET RANGE-T—Most data is swept on the Learjet III, third of a series of prototypes sponsored by the French Air Ministry, but the straight wing craft sports a wingspan some 11,000 ft. and is designed to cruise Mach .99 in level flight. Apparent differences from earlier models include yellowish cockpit glazing instead of silver, tandem main wheels and tip-tanks. Note retractable wingtip vane. Flight tests are underway.

Latest Styles in French Aircraft



FLYING ANTIFANK WEAPON—Lightweight Pater 55 is designed as a low-cost way to produce tank-buster, using rockets or air-to-ground guided missiles. The powerplant system, a two-locomotive in use. Power is powered by a 140-hp Telet 1050 piston engine. It spans 45 ft. and has a 30 ft. length. Gross weight is 5,110 lb. and empty weight 1,680 lb. Cruising speed is given as 140 mph and range as 270 mi.

NEW MAGISTER (PT TRAINFR)—Latest two-place biplane Magister (below) features a conventional tail in place of V-configuration on earlier model. Plane shown is designated CM 170K-02. Two 500-hp engines used. One on each side of the fuselage.





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WHO'S WHERE

In the Front Office

Robert A. Lovett, former Secretary of Defense, has been appointed a director of North American Aviation, Inc., Los Angeles, Calif.

Frank Pace, Jr., former Secretary of the Army and now executive vice president of General Dynamics Corp., and Lawrence E. Robinson, General Dynamics senior vice president, are new top executives of the firm, Consolidated Vultee Corp. August C. Hammer, manager of General's P. W. Allen Div., has been elected a vice president. Charles of the San Diego Div. T. M. Fugitt, manager of F-101 flight test operations, and W. R. Harrell, manager of flight production.

E. A. Belland, vice president and manager of Advanced Aviation Service Co., has been appointed vice president and assistant to the president of the parent organization, General Corp., Los Angeles. J. J. O'Brien is new manager of Advanced Aviation Service.

T. A. White, Jr., and **B. C. Roopert** have joined as assistant controller corporate houses in General's A. White, Inc., serving as president and vice president respectively.

Changes

Leo A. Tolson has been named executive director to the vice president of Philippine Air Lines.

Paul F. Knutson has been appointed an executive assistant to the senior vice president of Continental Air Lines.

Ken D. Gorman has been promoted to chief project manager for McDonnell Aircraft, Inc., Hawthorne, Calif. **Thomas Pratt, Jr.**, is now production test pilot.

Warren E. Alberts has been named director of technical engineering for United Air Lines.

Samuel Bauman has stepped as director of publicity for Continental Air Lines and joined Texas World Airlines as public relations manager in Los Angeles, succeeding Ernest Beaman, now Mobile and Fort Lauderdale.

Richard M. Gorman has been named assistant manager in charge of operations of Santa Alberto Co. S. de C. de Mexico, after having been in charge of operations of the company. **William Dixon**, Production Engineering Div. manager, and **Maxim L. Nelson**, manager of the Quality Control Division.

Honors & Elections

Reg. Gen. Samuel E. Harris, Jr., first commanding general of Arnold Engineering Development Center, Tullahoma, Tenn., has been awarded the Air Force Legion of Merit for "outstanding service during the acquisition of the Air Research and Development Command."

Mr. Louis D. Gaudin has been promoted to Assistant Director of the Department of Aeronautics, especially his knowledge of the Institute of the Aeronautical Sciences.

INDUSTRY OBSERVER

Protection treaties are there was another exception to Defense Secretary Wilson's report that combat strength has not been cut in the defense outlays. This is the case with the Navy's new shipbuilding program. These outlays showed the outlays, **Ball Aerospace**, Massachusetts Institute of Technology, and Federal Telecommunications Laboratories at Norfolk, N. J.

Convair F-107 World's new cruise missile and modernization program-wide just started with the YB-36, second of the aircraft to be built, and ultimately will encompass all B-36s in service—a design to get a standard configuration for all the big bombers. It will mean greater interchangeability of parts and major components between the different B-36 models. Nearly 5,000 persons will be employed in the program of its peak.

Air Force has disclosed a \$504,000 project for modification of jet Marine B-61 Makoel photonics bombs to incorporate test equipment which later will be used in test and training programs on the Hughes Talons, anti-aircraft weapons, other types of photonics aircraft, and rockets.

Boeing-Seattle's new hangar will have the largest unanchored doorway in the country, 785 ft. long, 65 ft. high, and is designed to house four B-52 Superfortresses at once. This is another indication that the prospects for quality production of the big eight-jet bomber are brighter than some people say.

Mooney Aircraft, Knoxville, Tenn., has two subcontracts of its Model 18 one place in development contracts for military applications. Mooney expects to get production rate of the Model 18 up to one a working day by August, while grooming the four place Model 20 Scimitar pretty good to fly any day soon-for quantity production.

A new device which flares a light or rings a buzzer in the cockpit of an airplane is being developed by the U.S. Navy. It is called the Selective Signaling Device (SSD), from the flight crew time continuously monitoring its receiver over long flights, particularly during static conditions. Several thousands are now in development in Seattle, which expects only the addition of a small amplifier in the airplane.

De Havilland Aircraft flight crew will be able to fly the U.S. coast without refueling over the first time this fall when American Airlines gets its first Douglas DC-7s for its new transcontinental service.

Naval de Havilland Gross jet engine is described as Britain's best in the 15,000-hp thrust class, but it is now running at considerably below that rating. Gross is a simple, lightweight jet with a very high efficiency component. Contrary to some reports it is not using titanium, use is its development to 25,000 hp class in less than a year. The Howard and General Electric engineers worked closely on the engine's development under terms of the de Havilland-GE technical assistance agreement. Development costs of around \$2.5 million, all private venture capital, are in firm figures. Projects are it will be the powerplant for several of the next generation of British jet fighters still on the secret list.

Roll-Rolls can get all those powerplant contracts to supply A-1A 7 jet engines for the F-105s which that will build in Italy. However, the last 50 airplanes in its roll will have GE J47 powerplants. First deliveries of A-1A powered Sabers is due to fly in about a month. Harris said that on paper American performance can show up better than other Sabers, F-105, Hawk, and Swift. However, this year's new Rolls turned down a proposal to supply A-1A for Canadian-built Sabers from RAF under arm and. Instead, USAF supplied GE engines. New Rolls has A-1A to spare.

Boeing Project X Details

First U.S. Jet Liner to Be World's Fastest

- Prototype is scheduled for first flight in 1954.
- UAL and AA appraise transport next month.

Boeing Airplane Co.'s new, revolutionary Model 707 jet transport is expected to hold a considerable edge in speed and power over all third land. Current details of the prototype reveal the work.

Specifications for the new jet liner now are in the hands of potential air line customers.

Data available indicates the 707 will cruise at the near-500 mph. class, yet maintain around 500 mph. The jet liner was selected to block, speed in normal transport operations is high at 550 mph, for some distances.

This would give Boeing an appreciable advantage over its Handley now quoted 470 mph. speed for the Const. 1, 500 mph. for the Const. 2 and slightly more than 500 mph. for the Const. 3.

Details of the 707 were not authorized for release in Boeing but American West was aware of this because by reliable sources.

With the big airplane already under construction at Boeing's Renton, Wash. and due for first flight in the summer of 1954, it is assumed the quoted specifications are fairly well established. However for progress made in the prototype program, the 707 is expected to still use the basic form line materials as it is described.

• **Open Cabin**—There is a possibility of more serious alterations, however, after a West Coast conference next month with American and United Airlines for the biggest potential customers for the 707 airplane. The air line is expected to confer with the four big West Coast transport airlines—Boeing, Douglas, Lockheed and Convair—on what jet line equipment the air carrier will have changes the airlines will, without reason, probably, will be made, if serious means a rule.

Cost of the jet transport has been estimated at \$4 million. (Variation West May 4 p. 14)

Compared to recent reports, there still is an open choice between the two-

Weight Statement for 707	
Boeing quotes the following weights for a five-seat standard domestic passenger version of its new 707 jet transport in a statement to potential airline customers.	
Weight empty	83,000 lb.
Service and baggage equipment for passengers and crew	170 lb.
Water and food for passengers and crew	170 lb.
Crew & baggage (three in cockpit, three in cabin)	1,000 lb.
System fuel and oil	670 lb.
Provisions	40 lb.
Operating weight empty	92,120 lb.
100 passengers	15,000 lb.
Passenger baggage	4,000 lb.
Crew	5,000 lb.
Total payload	35,000 lb.
Fuel (13,012 gal. at 5.5 lb./gal.)	71,616 lb.
Gross weight	199,000 lb. *

* Apparently, Boeing was allowing some 12,000 lb. margin in its calculations.

body and tailoring types of transport. It is held the advantages of earlier design and more proven, powerful over unreliability and steady service record of large U.S. transports.

Designed for meeting transcontinental and for trans-Atlantic service, the new 707 is longer and heavier and carries more payload than the earlier Boeing Model 477 jet transport design or current piston engine transport.

• **Dimensions**—Payload, a gross weight limit of 199,000 lb., including 35,000 lb. payload, is quoted for the 707, compared to 145,000 and 150,000 lb. for the Stratoliner and 175,000 and 150,000 lb. for the current four-engine piston Model 477.

A diagrammatic passenger arrange-

ment for the 707, described in data submitted to airlines early for first-order buying, with a total capacity of 300 passengers.

• **Edge Over Const**—Boeing has announced that Project X, first designation for the 707, will be powered by four RB-211-17B.

The new airline data indicates that the engines selected will be a commercial version of that powerplant, designated as JT-31. It is rated at 11,000 lb. thrust, with 10,000 lb. for the JT-31A. It will make Boeing's jet prototype the most powerful transport flying and service, holding a considerable edge over the de Havilland Const. 2 with its Rolls-Royce Avon 500, rated at 6,500 lb., and the succeeding Const. 3 with Avon 500, rated at 9,000 lb.

• **Sketches**—Over Stratoliner—The 707 is comparable to a stretched out Boeing Stratoliner in dimensions and general layout of the fuselage. Fuselage length is 127 ft. 11 in. overall. But this includes overhang of the horizontal stabilizer and elevator to actual fuselage length is 122 ft. 2 in. Passenger cabin is 39 ft. 7 in. long. 10 single doors are 112 in.

Stabilizer span is 70 ft. 5 in., total length of airplane is 38 ft. 5 in. to tip of fin. Maximum height to fin, under folded, 27 ft. 6 in. Clearance between fuselage from ground is 37 ft.

Thin covers with 116 in. 4 in. overall length of the Stratoliner. However, only the upper deck of the 707

prototype carries passengers, lower deck is designed for baggage and cargo. The 707 fuselage appears much like the four with side of the Stratoliner's "knee S" fold in.

• **Extremes**—Configuration—The 138-ft. span wing of the 707 is swept at the base 15-deg. angle back to 30-deg. for the 8-47 and the B-52 bombers and is set slightly forward of the fuselage mid-point. It is set lower than a usual main-wing position.

Five ribs are slung under the wing in single pods, spaced out as follows: four centrilines of fuselage to centerline of main pods, 35 ft. 7 in.; four centrilines of fuselage to centerline of outboard pod, 45 ft. 7 in.

Pods are interchangeable, permitting 30-mph. engine change time. Single-piece removable main cross ribs (provided, also cooling lugs at the top and ribs between) are provided and fittings are specified throughout the entire area, and a fire cut separates the compressor section from the burner and before section of rear.

• **Fuel Arrangement**—This is low tail end on struts, outboard of the outboard pods, one 470-gal. tank in each wing, between pods in each wing, one 2,110-gal. tank, between main pods and 3,870-gal. tanks and to fuselage. This adds up to 11,660 gal. Additional 4,200-gal. capacity is in the wing center section.

Single-point, under-wing refueling is provided, with one location under each wing. Fuel system is suitable for use with fuels containing up to 30% aromatic, including JP-4 and JP-4.

• **Control Surfaces**—Afterburner air-blast and exhaust outflows, the former and at all speeds. But outboard air-blasts are taken down flaps are retracted, need only at low speeds.

Spilers, similar to those used on the B-52, are located on the upper surface of the 707 wing just forward of the flaps. There is a set of two spilers for each flap section to augment lateral control and increase drag. Flap deflection is 20 to 30 deg. for lift-off; 50 deg. for landing.

• **Wing Loading**—Wing area of the 707 adds up to 2,400 sq. ft., compared with 1,500 sq. ft. for the Stratoliner. This figure sets it at 79.16 lb./sq. ft. wing loading for the 707 at 199,000 lb. gross weight, compared with 80.5 lb./sq. ft. for the Stratoliner at 145,000 lb.

The 707 wing appears relatively thick at the root. It is about 21 ft. 8 in. in 94 taper and 5 deg. dihedral.

• **Landing Gear**—Main landing gear is a four-wheel bogie arrangement similar to the 3-47 jet, retracting inboard into the belly.

Nose gear with dual shock absorbers forward, has a maximum steering angle

Grueman in AIA

Consensus Aircraft Engineering Corp., Bethpage, N. Y., after going a little 11 years, has affiliated with Aerojet Industries Inc., the last major aircraft manufacturer to join.

Consensus withdrew from the old Aeronautical Chamber of Commerce, AIA's predecessor, in 1942 and had not been affiliated with its industry association since. AIA now has 120 corporate members, including virtually every major aircraft and propeller manufacturer and most of the big component makers.

straight line to a rear point at the tail.

• **Propulsion**—Stratoliner—Engines are piston-type, and other auxiliary power with the aircraft has not been finally selected. However, increasing use of piston-type or large auxiliary air can be caused by the weight saving of an engine with air, as an actuating fluid may be selected in this case.

Boeing's earlier transports—707, Stratoliner and 377 Stratoliner—were almost entirely electric auxiliary power.

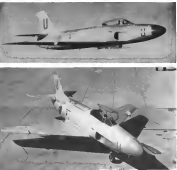
AA Predicts Summer

Air Traffic Record

American Airlines predicts an all-time low for air transport between the summer. Sales will be the summer high, it is expected.

The reports American's passengers will have gained 30% in May, compared with a new high. Load factors dropped four points because capacity gained 25% with addition of eight new 54-passenger Douglas DC-6Bs in the past 12 months.

American's aircraft capacity next month will be nearly double last July.



NEW LOOK AT SWEDISH ATTACK JET

Latest view of the new two-place, all-weather J 29-32. Lower attack plane recently under development by the Royal Swedish Air Force. These pictures show the first prototype, powered by a Rolls

Royce Avon turbojet turbojet. Production version will have a four-engine of the Avon, built in Sweden and equipped with an afterburner. Nose subsonic engine canopy and short leading edge wing feature.

- **Reduction in financing of economic aid items:** \$1.6 billion.
 - **Elimination of combat planes for a small increase:** \$235 million.
 - **Reduction in AF in jet support:** \$167 million.
 - **Titanic reductions:** totaling \$4 billion, were offset partially by these additions that totaled \$1.7 billion.
 - **Financing of more long term left in the revised budget:** \$347 million.
 - **Additional ground-based costs put on revised budget:** \$100 million.
 - **Continuance for procurement of long lead time items put in the revised budget:** \$16 million.
- Tim Dickinson, who said that Wilson's net reduction for the financing of economic aid items is \$500 million. Of the \$1.6 billion before, said \$447 million was put back in.
- **\$36 million more for ground-powered and electronic equipment.**
 - **The \$1.6 billion-reducing \$625 million recommended by the Administration for fiscal 1974—that will be available for financing major procurement other than defense, as of July 1, will lower the program for four years at a spending rate of 375 million a year.**
 - **The spending rate for fiscal 1973: \$54 million a month.**
 - **The \$59 million requested by Vandenberg would add 26 days to the defense financing period bringing it to four years and 26 days, Wilson said.**
 - **The \$16 million of ground-powered and electronic equipment for which this amount is requested is required, it can be financed without difficulty by slight adjustments within the sum of \$1.6 billion which would be available.**
 - **\$500 million more for maintenance and operations.**
 - **The Wilson budget allows \$51.2 billion, instead of the \$49.5 billion.**
 - **"These reductions, both in overhead and improved speed distribution," the Secretary declared, "which should enable the Air Force to get along next year on the same amount of money as we are now using."**
 - **He pointed to repeated criticisms from the last Democratic-controlled Congress for reductions in this area of AF activity.**
 - **Wilson noted that accounting of fiscal 1971 maintenance and operations funds.**
 - **USAF requested \$5.6 billion. The \$4.4 billion allowed was cut \$267 million by the House Budget. USAF protests that this cut would "accelerate a critical downward slide." Senate made an additional \$200-million cut. Of the \$1.6 billion funds voted by Congress, said \$1.2 billion was used by USAF for maintenance and operations.**
 - **In other words," Wilson con-**

cluded, "although the Air Force actually received only \$1.2 billion this year, it created that the appropriation of anything less than the \$1.6 billion in the budget would have created a deficit on the operations of the Air Force. Some of the other consequences are now threatened unless an appropriate \$500 million more for fiscal '74 plan was actually used this year."

\$475 million more for aircraft personnel.

AF's plan for utilization of the 370,000 total of military personnel provided for in Wilson's program "included some numbers of military police, headquarters administration personnel, personnel specialists, clerical specialists, chauffeurs, food maintenance and related types of personnel such

in grounds keepers and pest control." By adding substantial reductions in these areas, Wilson says, it will be possible to keep pilot training and other aviation programs at the current levels. **\$300 million more for base construction.**

As with other USAF programs, Wilson concluded that the base construction program is "overfunded." What-over gain in air wing strength is delayed again, he said, until he finished with the money surplus on hand. With the \$400 million in new money added for fiscal 1974 in the Wilson budget, the Defense Secretary argued, USAF will have a backlog as well as a surplus for fiscal 1975, and \$2 billion available for new construction in July 1.

USAF Axes Kaiser Aircraft Role

Contract cancellations halt firm's C-119 production and eliminate all but "a handful" of C-123s.

Air Force Secretary Harold Talbot last week announced cancellation of the C-119 Kaiser Aircraft Corp. contract. Kaiser Corp. is preparing a steeping rebid to rebuild of Willow Run C-119 production before a Senate Armed Services Investigating Subcommittee.

The USAF Secretary also announced cancellation of the C-123 contract with Chase Aircraft Co., 49% owned by the Kaiser firm. An Air Force spokesman said, however, that "a handful" of C-123s would be left in the program (Aviation Week & Space News p. 14).

In testimony of Chase's performance on the C-123 contract was met on the Senate subcommittee's agenda.

Another Kaiser firm, Kaiser Aluminum and Chemical Corp., took the brunt of USAF's criticism in the last year's program (see p. 14).

Kaiser continues in production of the K1380 aircraft engine, which became known as the Wright Corp. Under contract with Boeing, Chrysler and Ford, it is marketing engines for the B-57 bomber and under subcontract with Lockheed Aircraft Corp., is building turbochargers for the X-45 "Pulsar" fighter.

Fixed-Bid Offer: In cancelling the C-119 and C-123 contracts, USAF did repeated Kaiser's offer made at a summit of the Senate subcommittee. "In order to utilize the Kaiser contract as a basis for the production chain, will efficiency in our company," the Kaiser spokesman is promised to negotiate a fixed-price contract without subcontracting for the completion of the C-119 work, provided that order cancellations are negotiated for the price contract on the C-123 aircraft transfer."

Percent Kaiser Air Force contract for the C-119 flying bomber is on a non-fixed-price basis. Kaiser's offer to change the contract was not seen as a new, but a revised, bid (see p. 14). (The name of Kaiser Aircraft Corp.) announced aircraft production activity. Edgar Kaiser, son of the firm's founder and president of Kaiser Motors, and records that Willow Run had about 20% of its output left.

Tim Fairchild: The younger Kaiser, involved at the time that the firm already has spent \$50 million toward production of the Chase C-123B assault transport.

Chase Aircraft Co. is 49% owned by Kaiser Motors.

Harold Kaiser, board chairman of Kaiser Motors, declined to see Fairchild in the firm's Chicago office. Fairchild is in the C-119, changing that Fairchild all along had "attempted to subvert and undermine" Kaiser's production of the C-119.

"Now," he added, "Fairchild is trying to get out of C-119 contract, because that makes the C-119 all over but a short list, more the C-123 with the recall of today's Air Force letter from C-119."

Kaiser Contract: Kaiser changed that Fairchild has been "dragging its feet" in supplying required technical data was to Kaiser's second-source question. Fairchild was paid \$1,785,000 by the Air Force for supply technical assistance in looking up of Willow Run, he explained. He said the firm supplied tooling blueprints and drawings that were "adequate, complete, detailed as necessary."

On the subject of costs, which earlier hearings determined were five times

that of Fairchild's in production of the C-119, Kaiser said.

The expression that certainly has left in the public mind that Fairchild's cost per plane was high, he compared with our costs. The \$200,000 cost of Fairchild in after Fairchild has had the benefit of a government-owned plant, free of rent in Fairchild, a large number of its tooling costs and plant construction costs written off on previous projects and having experience gained in over 600 of the same basic type."

Fairchild's cost: He referred to the C-123 which Fairchild originally developed as a cargo transport which produced the C-119.

Kaiser's cost: He said, in comparison with Kaiser's cost of \$1,200,000 a plane which is based on a previously-owned plant, with all of the tooling and all the plant re-arrangement costs written off as a total of only 159 planes.

"No one brought out the fact," he said, "that Kaiser built 800 or more of this three type of aircraft, in cost that was \$200,000 or less."

Another cost: Kaiser, he said, "building C-119s," while Fairchild is building the C-119C, he told Kaiser that he approximately 30% of the F model is different than the C.

"There are some 50 changes required to develop the F model," he explained, "the major changes being different engines and a change from electrically actuated landing gear and control surfaces to a hydraulic system."

Model C Change: Original need to Kaiser contemplated building the C model.

The change to the F model was ordered in January 1961, six months after the original contract was awarded, he said.

"Fairchild was responsible for informing Kaiser the engineering information on the change from the C to the F, but, complete engineering information for the F model was not received until a year after the base of the contract change. A number of the present parts furnished Kaiser by Fairchild, were C-119C parts and Kaiser had to modify them when possible to F parts."

Kaiser told the committee the C-119 contract award was a result of an Air Force proposition, that Kaiser had been considered for almost a year, in preparation for converting the Kaiser Willow Run plant to assault production.

Meanwhile, Kaiser had expected to produce B-45 at Willow Run, but, at the time of the C-119 contract, he said, he was not in the mood for C-119 transports was greater because of the Kaiser's own and Fairchild's bigger size, he said, finally was unable to meet Air Force re-

quirements for the letter plane.

Depot Testimony: It made sense for the Air Force to select a plant that had the maximum 100,000-sq-ft monthly capacity of Willow Run. At Willow Run, the Air Force is having something for more important than just plants, additional productive aircraft engines, ready for use in an emergency, Kaiser said.

"Defense of America depends on its ability to produce large quantities of military equipment on a moment's notice when the emergency arises. This can only be done if the capacity to produce is in being before the emergency."

Kaiser quoted other testimony that costs of C-119 production at Willow Run increased as plants were awarded on an annual schedule of \$180,000 per plane to \$1,300,000.

"The fact is," he said, "that Kaiser actually delivered six aircraft of \$150,000. The fact is that the first Kaiser aircraft for the number of planes actually being built, in the stretched-out schedule actually being followed, is the estimate reflected in the defective contract for 150 planes. This estimate totaled \$175 million."

Explosion Costs: A mixed estimate was made in May this year, he pointed out, which totaled \$395 million, in an estimate of 10% to 15% of the actual cost in labor and material costs were responsible for "a portion of that increase."

As to several specific costs, Kaiser reportedly had charged expenses to Air Force, Edgar Kaiser said.

"We never asked the Air Force to pay for our air support expense... to pay for any part of the \$60,000 man housed in the cost of the delivery company for the last C-119... or to pay for erection carried on an aircraft stand."

"Fairchild was responsible for informing Kaiser the engineering information on the change from the C to the F, but, complete engineering information for the F model was not received until a year after the base of the contract change. A number of the present parts furnished Kaiser by Fairchild, were C-119C parts and Kaiser had to modify them when possible to F parts."

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House Vetoes Wilson Cat in Atomic Funds

Congress appears set to go along with the Administration's division of atomic powerplant development, but the House has considered Defense Secretary Charles E. Wilson's cancellation of an aircraft carrier atomic engine.

In voting coming this 1974 funds for the Atomic Energy Commission, the House.

Clears a \$7.4-billion cut made by the Administration in the program for development of an aircraft propulsion system. The Truman budget's recommendation of \$2.6 billion was reduced to \$17.7 million. In fiscal 1973, \$17.7 million was included in the program.

Eliminated \$35 million for development and construction of an aircraft carrier powerplant, which also would be utilized for the generation of electrical power. Of the \$5 million set aside for research, \$5.1 million for preparation of plans and \$7 million for construction.

The Truman budget recommended a \$23-million total for an aircraft carrier engine, of which \$16 million was for research and \$12 million for construction. When Wilson revoked the "only requirement" for a carrier reactor, the project was canceled by the Atomic Energy Commission, resulting in \$1.7 million cancellation cost.

At House Appropriations Committee hearings, it was developed that a single-purpose industrial reactor, built without consideration for space, would not be adaptable to ship use, but that a plant for carrier use also would be adaptable for industrial use. The House directed AEC to develop the latter.

The total returned cost is \$175 million compared with \$100 million for the single purpose use.



THORP TESTING NEW PRIVATE PLANE

First view of the new Thorp Super Shooter, a two-engine all-metal private plane, long tested on the West Coast. In Angeles, John Thorp, has been piloting the aircraft in a Thorp's Big Bear, Calif., facility was unable to meet Air Force re-

quirements. Though resembling the 65-hp Sky Shaker which first flew in 1946, the new plane appears to have a larger wing and a fitted with a P-1000 jet exhaust. Further back on other Skins was lower than on the plane.



RAF Picks New Swift F.4 Over Hunter

By Nat McKitterick
(McGraw-Hill World News)

London—For several months the Royal Air Force has battled over matters of its two best air fighters—the Victor Supreme and Swift and the Hunter Hunter. Both have been ordered, the Hunter has been bought in quantity by the U.S. under the air-force package program as preference to the Swift that met the work it has never been thought they should satisfy the RAF would support with large orders.

New Aviation Week has learned as closely that the RAF has come down on the side of the new Swift F.4. The Swift F.4 is powered by a Rolls Royce P.A.7A jet with afterburner rated at 9,200 lb thrust. It costs less than \$10-million. A large additional order for Swift F.4s is expected soon, some 375, including a few Swift F.1s, Swifts on order.

► **U.S. Ties Down Swifts**—In order to allow the RAF to make plans on the basis of firm delivery dates, the British government has asked Washington for assurance that the U.S. will not offer to buy Swifts under the air force package program except for delivery after 1986. That is a complete assurance that the British will not buy the Swift F.4 in favor of the Hunter Hunter on the basis of any light report to the USAF that the Swift F.4 is the better buy than the Hunter Hunter. Gen. Lord, who flew the Swift F.4 and the Hunter last November.

Noting as the RAF decision meets the conclusion that the U.S. bought a package when it supported the Hunter. The facts are that after extensive, independent flight tests and technical evaluations by the RAF and the USAF, the U.S. chose the Hunter and the RAF favored the Swift (although Britain has ordered the Hunter, too). The RAF didn't make up its mind until

after the Swift F.4 first flew back in March.

The RAF favors the Swift over the Hunter largely for one reason. It has extra baggage and therefore greater range. And otherwise RAF thinks the new Swift F.4 is roughly equal to the Hunter. That is, the RAF thinks the Swift F.4 is a slightly more flexible aircraft.

► **Production Problems**—The Swift will be in squadron service later this year a step ahead of the Hunter. First Swifts will be F.4s, which eventually will be modified into F.1s. Second Swifts are now flying and possibly will appear in a formation at the RAF command air show at Odiham July 15.

Production-wise, the Swift is a major problem than the Hunter, requiring more tooling. But Victor Super course management has set up an American-style production network of seven plants in the neighborhood of Swifts, Mendota, Wisconsin. There is a new factory and possibly subcontractors are set up in place, including plant buildings. Sheet Metal & Hardware at Beloit and Heland Aircraft of Southborough.

When he heard the Swift F.1 last November, Gen. Lord was disturbed by wing stall. He was very impressed with the Hunter's handling characteristics. When he was assured by Hunter designer Sydney Gorman that the proposed addition of tanks, winged under the Hunter's wings, would bring up the range in line with the Swift's, Gen. Lord gave the nod to the Hunter.

► **A Better Swift**—Swift designer Joe Stalla, meanwhile, was hard at work perfecting his F.4 to eliminate Lord's objections. Wing fences appeared on the F.4, and wingtip stall disappeared, officials say. An Avon with afterburner was installed and proved to be controls was boosted considerably. As a result, Victor's claim that the F.4 is "unsuitable in speed, maneuverability and rate of climb."

Whatever the relative merits of the

choice, the RAF has been swung over to the Swift.

The RAF decision is bound to have some effect on orders for Hunter-Hunter has in hand orders for about 500, placed originally by the RAF. But the U.S. is financing 450 and making delivery by June 1975. That means a very considerable number of Hunters originally ordered by the RAF are going to have to be diverted to NATO or the U.S. air-force purchase order. In addition, the U.S. is financing part of the production of more 300 Hunter airplanes at Palmdale in Holland and Rolls-Royce R.A. 7 Avons to go into them at Palmdale, National in Belgium.)

Two types of Hunters are on order, one powered by R.A. 7 Avons, eventually with afterburner, the other by Avon-800. Both are expected to be delivered by late 1975. The first Avon-800 is the first U.S. financed Hunter. The first Avon-800 is the first U.S. financed Hunter. The first Avon-800 is the first U.S. financed Hunter.

CPA Plans DC-6B Flights to Hong Kong

Canadian Pacific Airlines has started flying from Hong Kong to Vancouver and plans to extend the service to the Great South Bay. The airline was scheduled to start this September, using 50 passenger DC-6Bs.

CPA plans to fly over U.S. immigration and customs by going straight through from the Great South Bay. The airline was scheduled to start this September, using 50 passenger DC-6Bs.

Regular DC-6B service is scheduled for September 15. CPA took delivery June 17 of the last of four DC-6Bs on order. The airline will receive two more DC-6Bs in August and September. These cargo planes are readily convertible to aircraft.

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POWER ↓

WEIGHT ↓

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Consisting of a simple hose reel, easily installed or removed from the tanker aircraft, a flexible shaped drogue and a retractable probe in the receiving plane, the system is simplicity itself. No special crew training is necessary. Probe repeat contact is simpler than making a landing.

Because of the flexible nature of the system, refueling can be accomplished in rough air and the rigidity of fuel transfer center pressure reduces the contact time to just a few minutes.

For the United States Air Force and the United States Navy, aircraft are now being equipped with FR refueling equipment to give our fighters and bombers virtually limitless range and/or duration.



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Flight Refueling, Inc. also makes the Jettex FR-1, a portable, flexible probe refueling system for landing aircraft. It is portable, flexible, and easy to install. It is a simple, reliable, and easy to use. It is a simple, reliable, and easy to use. It is a simple, reliable, and easy to use.

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- Belt is easily adjustable to comfort of wearer and may be instantly removed with one hand only due to the metal to metal contact.
- A webbing harness and webbing belt both available in plain, white knit or colored knitted nylon webbing to color to match fuselage finish. This is a light weight webbing belt durability plus distinctive styling.
- Two one-point contact rather than a three or four-point contact may be located on the back at slight angle and.
- Various type and fittings are available to suit your application.

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We also manufacture, in addition to other styles of seat belts a complete line of shock absorbers, shock absorbers and shock absorbers in our safety application. Send for brochures and price lists.

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AIRCRAFT INDUSTRY representatives participate in AF studies of crash cases.

and for broad power to investigate.

Gen. Hoyt S. Vandenberg, retiring Chief of Staff, called on his top assistants at the time the directorate was being personally read down the "out air" about giving flight safety the utmost consideration and has followed up with still more actions.

But more important than the Vandenberg directorate has been the actual growth of local accident sites which has won for Flight Safety Research in growing attention and respect in Air Force headquarters.

Monday Night—A day at the Executive of Flight Safety Research starts with a round robin staff conference in which the specialists detail various types of accident reports which have come in by teletype during the night. The director or his deputy assigns an immediate action to be taken in each case.

When an Avianco West staff member sits in on one morning conference, the director's reports included such variety as:

- A student pilot who slipped into the propeller of a Piper Cub trainer on the ground and lost a hand.
- A Republic F-84 in a low-level go-around over the Gulf of Mexico dropped a wing, on the water and was lost.
- A tanker accident in a Navy R4D (Super DC-3) reported by Navy headquarters with the directorate.
- A series of follow-up reports on accidents reported earlier.

Like reports are generated by officers who are specialists in fighters, bombers, transports, cargo planes, etc., according to type of aircraft under consideration. The conference discusses probable cause, possible accidents on record, and desired facts needed, before action is directed.

Proceeds only for preliminary reports on major Air Force accidents are down to coast into Western AFB local quarters within six hours after an Air Force base learns of an accident.

Local base commanders are instructed to hold airplane accidents at once 24 hours to give the Flight Safety Research's Investigation and Safety Engineering Division time to determine whether to send special representatives to participate in the investigation. In accidents with relatively simple causes, the investigators accept reports from the local base's accident investigation board and flight safety officer. But whenever there appears to be a doubt, Western investigators fly to the scene of the accident to make their own independent inquiries.

The investigation may require a team of specialists, including an airplane commander who is charged with the type of craft which crashed, a physician to check into the personal factors involved in the crash, a technical representative from the company whose plane is involved, an engineer who will study structural factors.

• **Western Heads-Go! Theodore Q.**



This picture of the Convair 340 shows what Rohr is famous for — building power packages — power packages for the Convair 340 — and other world-famous commercial and military planes. Of course, Rohr aircraftmen do more than this. Currently they are producing more than 25,000 different parts for all types of airplanes.

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CARGO PLANE safety specialists check Lockheed accident before crash crew clearance.



Overhead Line, Inc.

in instruments where reliability is imperative

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where other materials fail

To assure maximum service life and accuracy, engineers at Lear, Incorporated, planned to protect their new vertical gyrocompasses from corrosion by housing it in a completely inert and dehydrated atmosphere.

Seeking the best way, however, proved to be more easily said than done. Despite the most elaborate pretensions, solder and flux fumes often penetrated the joint and contaminated the delicate mechanism. Once sealed, it was impossible to reopen the case without loss of the expensive cover and harness.

To both of these problems a simple and ingenious solution was found. A thin O ring of Silastic proved to fit snugly under the cover flange in order to exclude the

corrosive fumes generated in soldering a metal strip over the entire joint. The Dow Corning silicone rubber O ring is not damaged by soldering temperatures. And, the gyro mechanism is just as accessible for repairs as the mechanism of a hermetically sealed case of coffee.

Lear also used a large ring washer of Silastic at each end of the housing to serve as resilient, shock-absorbing cushions for the apparatus in atmospheric temperatures.

And that's just one of hundreds of examples of how Silastic is used to improve the performance of products ranging from cables to traction motors, from domestic steam trams to aircraft.

Craft chief of the Investigation and Safety Engineering Division, is a test case line engine pilot who led a B-24 wing in Italy in World War II and a B-29 wing in Korea, and headed the 10th Transport Wing at Patterson AFB before World War II.

Capt. Francis S. Gehring, U.S. 98, was in Korea and World War II on both B-29 and B-24, and, in fact, a chief of the Combat Operations Branch.

The staff of investigation pilots includes some of the Air Force's most experienced flyers. Although the B-47 only recently has gone into regular service, Capt. Ken Lee, a Stinson commander, can be seen flying it, as well as others who are checked out on B-36 and B-59 command, and jet fighters, cargo, transport and helicopter experts.

Engineering Staff—Expanding branch activities provides for jet propulsion, electrical and hydraulic systems, guided missiles, structures, propulsion, and those engineering specialties assigned to check new aircraft designs for deficiencies in safety features in engineering and accident inspection and to analyze new and existing aircraft for ways to improve their safety design.

The safety engineers check over the Air Force's line of command for aircraft designers, and for standardized engineering practices by aircraft manufacturers, and make recommendations for revision based on safety practices.

Design Branch—This group, the Flight Safety Research group, started using design briefs, defining good safety design practices based on their studies of accident reports. These are being made available to expert manufacturers who are Air Force contractors, to other government agencies, and to Air Force commands.

Company Participation—Example of how the manufacturers' representatives assigned at Norton AFB work with the department in pushing the adoption of good safety design practices is seen in a recent article of the Consolidated Vehicle Design Safety Committee's work, which is the chairman by R. H. Buckley, Convair field engineer at Norton.

The principal duties are defined as:

- Review past accidents involving design deficiencies in all types of aircraft.
- Make a point of not actually caused by design error.

- Study procedures on design safety and accident trends made by the aircraft and make how they apply to Convair designs.
- Review current accident reports and confer with designers, personnel on safety design recommendations.

- Accompany investigation of B-46 accidents and review cause for design deficiencies.
- Make weekly reports to Convair.

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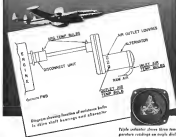
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How Alternator **BURN-OUTS** can be **Eliminated** with New Alarm System



Lockheed and Edson engineers jointly developed this new Transponder Alarm System to eliminate burn-outs and bearing failures in the high speed alternators (five speeds) of the B-47 and F-105 aircraft. This system allows the entire alternator drive system to be continuously monitored.

This new Edson System utilizes the same type of Edson components which already have proven years of dependable service in aircraft throughout the world. Standard high-voltage electrical resistance bulbs are placed in the drive shaft and gear hub bearings to detect an early temperature rise which might lead to a bearing failure. The sensitive part of the bulb protrudes the bearing and usually bears directly against the bearing race so that the slightest temperature increase is felt immediately and reflected on the left and right hand safety components of the single ground circuit.

Because of critical space limitations in the alternator shell it was decided to mount

the differential temperature across the rotor and rotor air passages. Two bulbs in the rotor air duct are connected to a single bulb in the rotor air passage and the differential temperature is indicated on the bottom side of the panel indicator. The primary purpose of this arrangement is to detect a temperature rise due to mechanical failure with the added advantage of detecting electrical overload. This safety feature leaves present die potting of preventing complete shut down by reducing the alternator load.

An integral warning alarm circuit completes the system so that the crew is alerted by visual warning with a reduction of any danger from critical temperatures.

Thomas A. Edison
INCORPORATED
Authorized Division
Dept. 48, West Group, New Jersey



PLAQUE awarded to USAP with outstanding safety record.

Worth for use of Plant Design Safety Committee and others according to the Worth to design design items at cost savings, saving.

Four other ballistics (technical) representatives at Norton who perform essential safety functions for the company: E. E. Kase, Douglas, L. W. Gaffa, Boeing, Richard L. O'Connor, Fairchild, and William Burke, Lockheed. Representatives of 10 other manufacturers make weekly visits to the base for similar technical items on safety design, and many other companies' representatives are welcome.

Supplementing its own technical staff, the department is free to call on Air Research and Development Command and Air Materiel Command engineers for their views on technical problems. One of the most effective means of speeding the safety decisions technically is by creation of content reports and recommendations to the two technical commands and to other commands throughout the Air Force, with requests for comments and recommendations for measures to prevent similar future accidents.

Nonconformance by some of the operating commands on grounds a safety recommendation is not perfect operationally often provides another "go-around" in the decision which ends up in a consequence recommendation aimed at getting the defect repaired practicable to attain its mission.

Amert Refused Aid

(McGraw-Hill World News)

Melbourne-Australia's third largest airline operator, Amert Airways Pty. Ltd., has been refused government aid in acquiring new aircraft. This makes another instance where the government has turned down financial support to privately owned airlines.



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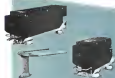
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from 300,000 to 20 in diameter, are made with only slightly over 4 in. In 840, 4140 and Types 316 and 410 stainless, each ring size is made up to 16 in. in diameter.

• **What about tolerances on these ring castings?**

The tighter the casting temperature required, the more difficult it is to hold tolerances. It is not put in another of them. It is also a question of finding suitable materials and foundries which will withstand the high temperatures.

One foundry reports making this wheel rings up to 1 ft in diameter with tolerances of $\pm .0015$ in. Another foundry is making 30 in. rings to

500 in., but wall thickness is greater, 1 in. diam. instead being closest to the inside diameter.

Using the losses economy or plastic processes, very close tolerances and thin walls are possible, although at present the use of such castings is limited.

• **How are some of these limitations in wall thickness and tolerances being overcome?**

By machining, in many cases. One processing method involves casting followed by rolling to thinner walls and no shape.

• **Is it preferable to weld stainless and inconel castings for aircraft use?**

Welding is permissible in few cases

now, using the Eloxal process.

• **Can light alloy castings be successfully superalloyed?**

High-temperature superalloys are being used, using silicon or synthetic resin to carry applications the synthetic resin are preferred because they are more resistant to aircraft oils.

• **What is the system in X-ray inspection for non-destructive casting?**

It is possibly the best method, as casting to one size. However, the usefulness of surface visual inspection should not be overlooked. With X-ray, interpretation is important. The cast must be set to reveal grosser cracks, about outlining the area by covering unimportant porosity and superficial flaws.

• **Where do castings find their most important field in aircraft?**

Without a doubt, at present, in aircraft engines. There are high grade aircraft quality parts. A tremendous field is developing for standard "T" grade castings in the field of limited service aircraft use, such as certain in guided missile service. —ES

DH Plant Score: One Every 2 Hours

Top production rate for aircraft in England—one every two working hours—is credited to the de Havilland factory near Chesham.

Eleven different countries are taking delivery on the new products for assembly lines at the big DH plant, the largest production facility in England. The products: Conquest jet transports, Dove and Heron piston-engine biplanes, Vampire and Venom high jet and trainers.

New Firm Repairs Rejected Plane Parts

A recently opened firm at Seattle is concentrating on repairing vendor equipment rejected by Boeing, Douglas, Cessna and other manufacturers in aircraft.

Boeing has been spending a reported \$50,000 monthly in repairing some of these parts, but a majority has been returned to the vendor-collector. After remark, the vendor repackages the parts, controls with increased paper work, and prepares the freight back to Seattle. In many cases, the freight handling and remark costs exceed the resale value of the returned part.

While working at Boeing, H. F. Stone became aware of the situation and organized H. F. Stone & Co. to repair rejected, saving flight costs, time and handling. The company has worked in the past few months on various new electrical parts valued from \$5 to

ONE OF THESE

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CLARE TYPE K RELAY

First small size, lightweight telephone-type relay. Famous for operating speed and resistance to vibration.



TYPE K-1—Adds greater operating range and sensitivity with double input coil.



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TYPE M—Operates on less than 30 milliwatts with 15,000 Ohm only 1 form C contact and standard adjustment.



HERMETICALLY SEALED RELAYS Type M hermetically sealed to prevent moisture—a feature available with all Clare relays.

CLARE pioneered the smallest size field with the Type K relay. Since that time it has been the industry of design engineers who must have a superior relay in operation is extremely small space.

The Clare Type K not only has the smallest size of small size and light weight, but it is capable of exceeding 100 operations per second, gives adequate contact pressure and all-around resistance to shock and vibration. Its long life and high-reliability dependability have enabled this relay to meet many complex engineering requirements.

In order to meet customer specifications which the Type K could not quite fill, Clare engineers have developed three other small, light weight relays. All retain the basic operating and physical characteristics of the Type K. Two of them, the Type K-1 and the Type K-2, have the same basic and standard construction of standard size. This has long been recognized as one of the major reasons for the superior performance of the Clare Type K relay.

The Type K-1 adds greater operating range and sensitivity in use of a slightly larger coil which can be used with 15,000 Ohm resistance. The Type K-2 adds still greater operating range and sensitivity by use of a coil and only longer lead of greater diameter. This Type K-2 is designed for operation on very low power (it employs a close-coupled magnetic core), gives a low rate of magnetic loss and light efficient coil design. This permits high sensitivity while retaining high contact pressure (minimum 30 grams) and adequate contact gap (minimum 0.0017").

All these relays are available enclosed in hermetic alloy metal gas filled enclosures which increase life, reliability and resistance under extreme conditions of altitude, temperature, moisture, fungi, dust and dirt.

Clare sales engineers are located in New York. For complete information call the nearest 4 line office or contact C. P. Clare & Co., 475 West 34th Street, New York 18, New York. In Canada: Canadian Electronics Ltd., Toronto 22, Canada. Address: CLARECO.

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CUTAWAY reveals details of Boeing's modified windtunnel with new two-stage fan.

Boeing Triples Windtunnel Power

Boeing's big windtunnel is back in business after a \$1.6-million modification job aimed at extending its capabilities.

More power, a new fan and an 8-ft. 10-in. test section are the three major features which have enabled Boeing to push the tunnel operating speed from subsonic through transonic and into the low supersonic range.

As a result, it is the only partially covered test facility with transonic speed capabilities, a distinction to be added to the fact that the tunnel is also the largest privately owned test facility in the country.

Modeling—Boeing tripled the original power in the tunnel as the first step in the program. Westinghouse was called in to build a new 34,000-hp electric motor which, coupled to the original 34,000-hp motor, provides 68,000 hp to blast air through the test section.

The new fan is a two-stage design, 24 ft. in diameter, with 36 three-foot blades on each stage. Blades are con-

structed of laminated spruce covered with glass cloth, nonmetallic of the fan is steel and aluminum.

The tunnel is a closed-circuit type; test flow is considerable heat added to the high-speed stream of air as it accelerates through the tunnel during a test.

A cooling air bleed has been designed into the modified tunnel to handle this, and in addition, heated air is wrapped off and exhausted outside.

Even for the modification of the tunnel was work done at the National Advisory Committee for Aeronautics, and disclosed by Helen to George Schreyer, Boeing technical staff chief. (This could refer to the so-called "open throat" which permits a tunnel to run at transonic speed continuously without the choking which would follow some closure.)

This recognition was a two-way street because Schreyer was able to pass on an improvement noted by Boeing which NACA will build into its largest and fastest transonic tunnel.



ENGINEERS watch high-speed windtunnel tests; check automatic recording of tests.

Navy Contracts

The following contracts were announced recently by the Navy's Aviation Supply Office, 700 Robbins Ave., Philadelphia 11.

Chandler-Evans Inc., New Haven—Ford Co. West Hartford, Conn., pump unit, 128 ea., \$24,000.

Shaw-Wood & Sons, Inc., 415 E. Pine St., New York, N.Y., fuel valves and accessories, \$27,751.

Halliburton-McMurry Co., 1700 Spruce Street, St. Louis, Mo., engine mounts \$3,110, engine...

James-Walker Co., 1100 Franklin Ave., Cincinnati 14, maintenance parts for motorcycles on F4U aircraft, 100,000, a. p. m. motor, 60 ea., \$112,000.

Monks Products Co., 10000 Broadway City, North York 20, 1000 1000 100 ea., \$10,000.

Kaiser Steel Co., 1001 Telegraph Rd., Los Angeles 12, motor stands for overhaul of aircraft engine, 100,000.

Arch & Polite, Inc., 1700 Broadway, Cleveland 1, engine parts, overhaul & accessories, \$10,000.

Brown Valve Co., American & Miller Co., 100, 1000 1000 100 ea., \$10,000.

Boeing Aircraft Co., 1000 1000 100 ea., \$10,000.

Boeing Aircraft Co., 1000 1000 100 ea., \$10,000.

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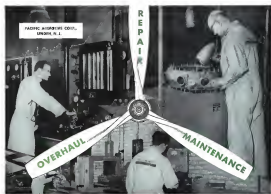
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Faith in the sky



The 1903 Wright Glider was tested in a lake and flew three miles with a man aboard. The following year the Wrights designed a propeller, built an engine, and made their first free flight!

What shape should a wing be? What pitch should a propeller have? Is a tail needed? No one knew the answers when Wilbur and Orville Wright were developing their airplane. By comparison, the propeller problem seemed easy. So the Wright brothers left this "easy problem" till last and concentrated on wing camber, elevators, and rudders, making their 1908 Glider aerodynamically sound. Used in the first plans

manufactured, Curtiss Tubing has become the standard of quality for fuel lines, landing gear, engine mounts, and other applications requiring ease of machining plus exactness in forming and fabricating.

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MAGNETIC blocks are used to build...



COMPUTER assemblies of any pattern

Magnetic Blocks Aid Computer Design

Standard magnetic building blocks for making up computer were involved recently before scientists at a meeting at the Naval Ordnance Laboratory, Silver Spring, Md.

They look somewhat like children's building blocks and can be arranged rapidly in any desired performance pattern, the scientists were told.

The blocks, in Magnetic Design Elements, were developed by Massachusetts Electronics Corp. They are described as completely flexible, basic components which can be used to build quickly the entire arithmetic, program, control and memory sections of digital computers. The blocks are one inch square.

They can be employed for both serial and parallel systems, anything from simple flip-flops and basic counters to large scale general purpose computers and digital differential analyzers, according to the firm.

The elements contain no electron tubes or transistors. They are cast in an epoxy-type resin for maximum resistance to shock and environmental conditions and lend themselves to full size production, for applications "where absolute minimum size is weight... are of primary importance," the company says. Use of the blocks will lengthen the

useful life of computers, as they can be shifted around to meet new demands on the computer. The true cycle of design and construction of computers can be shortened by a week, day and hour, instead of years using these blocks as the foundation of computing systems, the company claims.

Massachusetts Electronics Corp., 47 W. Water St., St. Paul, 1, Mass.

New Stainless Alloy Is Harder, Non-Galling

A new stainless steel alloy—V2B—has been announced by Cooper Alloy Foundry Co., Elmhurst, N. J. The material is reported to combine high load-

ing, non-galling characteristics and superior corrosion resistance.

It is a heat-treatable 18-8 type, containing copper, molybdenum, silicon and a very small amount of boron. It is reported readily available in the quarter annealed state and may be hardened by a low temperature heat treatment, which produces no distortion and only a light fading discolored, readily removed.

In annealed condition, the material is easily welded, using special V2B welding rods.

The alloy does not average at elevated temperatures, it is said. It can be produced in both cast and wrought form.

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**New jet engine designs
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With their introduction of the first axial-flow jet engine over ten years ago, Westinghouse engineers expanded their efforts to reduce aerodynamic drag to an absolute minimum. Continued designing and testing met with outstanding success on the J34 engine, first in its class with the smallest frontal area per pound of thrust . . . permitting the first two-jet aircraft design. The unequalled performance of two-jet planes in Korea has put real meaning in that record.

While the J34 was setting jet history in combat, Westinghouse had new pencil-thin engines in their test cells . . . new designs for a more powerful jet engine that promised even greater latitude in plane design. Today, those designs have made possible the J40 with the smallest thrust frontal area ratio of any axial-flow engine.

Realizing that even perfecting rivet heads can have effect on the speed of jet aircraft, Westinghouse engineers know that they must respect every aerodynamic factor. That is why they have maintained leadership in the development of axial flow engines . . . why they have designed jet engines smaller in diameter for given power output than any other manufacturer. That is why they have acquired a wealth of jet engineering and designing knowledge that will prove invaluable to commercial airlines tomorrow. Westinghouse Electric Corporation, Aviation Gas Turbine Division, Philadelphia 13, Pennsylvania.

J40J4A



Final Assembly Shows where in the last stages of assembly is the Westinghouse J40 . . . world's most powerful jet engine, fully qualified for production.

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PAGE
Welding
Electrodes
Rods
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Lockheed Tunnel For Ice Research

A new ring tunnel scheduled for completion in August is now being constructed at Lockheed Aircraft Corp. to supplement the company's established weather-making research facilities.

Intended for testing wings, control surfaces, de-ice boots, engine nacelles, air coils, exhaust stacks, bellows, air intakes, antennas and other installations, the 9,620-cu-ft tunnel will be situated by a 1,165,000-Btu/hr. refrigeration system.

Thirty square and high three winds will be available to duplicate flying conditions in any weather. The research device will test components at a simulated speed of 300 mph, at sea temperatures, but higher speeds will be duplicated for the upper freezing range, and slower speeds at as low as -94° F.

The tunnel's test section 74 ft in diameter and 37 ft high. The test section will contain 33 ft of.

Fast Writeoffs

Accelerated depreciation for new equipment, expanding their defense facilities is granted by the government in the form of certificates of exemption.

In the following list of seven contractors, companies receive a bonus, followed by a partial or entire cost of construction deemed necessary for defense or research, and the percentage of the expense cost allowed for fast write-off. Fast write-off permits property to be depreciated in five years.

- **Lockheed Aircraft Corp.**, Burbank, Calif., contract number 33-1246, 100,000 sq. ft., \$12,000,000, 100%, 100%.
- **General Electric Co.**, Burbank, Calif., contract number 33-1246, 100,000 sq. ft., \$12,000,000, 100%, 100%.
- **Lockheed Aircraft Corp.**, Burbank, Calif., contract number 33-1246, 100,000 sq. ft., \$12,000,000, 100%, 100%.
- **Lockheed Aircraft Corp.**, Burbank, Calif., contract number 33-1246, 100,000 sq. ft., \$12,000,000, 100%, 100%.
- **Lockheed Aircraft Corp.**, Burbank, Calif., contract number 33-1246, 100,000 sq. ft., \$12,000,000, 100%, 100%.
- **Lockheed Aircraft Corp.**, Burbank, Calif., contract number 33-1246, 100,000 sq. ft., \$12,000,000, 100%, 100%.
- **Lockheed Aircraft Corp.**, Burbank, Calif., contract number 33-1246, 100,000 sq. ft., \$12,000,000, 100%, 100%.



Now Showing on TV: Jet Tests

The application of television for testing equipment of jet engines and components is being studied at Pratt & Whitney Aircraft's Willoughby Laboratory.

The television system is aimed to overcome difficulties in the present method of test cell viewing. Engines under test are viewed from a control room through double glass panes. With the system installed in a fixed position, PWA reports it is possible to quickly and without television, to examine more than a small part of the engine at any one time through the restricted viewing point.

Recent experiments with the TV setup may make it possible for the test stand operator to view the test engine from every angle just by turning a standard television camera.

Present records of tests could be obtained by making moving pictures of the engine on the record screen.

Technique improved—PWA engineers first constructed a TV camera and accessories that showed precise but distorted photographs would be necessary. Chief difficulty was the limited distance the picture could be carried by cable to the recorder. The result could send a 71-in.-diameter cable would even a television image size about 15 to 20 ft. This was important in the large test cells of the Willoughby Lab.

PWA engineers then resorted to a compact industrial TV camera to overcome this difficulty. A distortion-free picture is now carried in as far as 1,000 ft over a small control cable of 1-in. diameter.

Better lighting has brought improved results. Jet results have been ob-

tained by using banks of ordinary fluorescent tubes.

Mobile Units—Only one reason is being used now, but it tests prove that PWA's cameras are better than those used in a single test cell. A mobile setup is being considered so that camera can be moved where needed for viewing at various angles. Most of the experimental work has been conducted by a PWA group headed by assistant project engineer Arnold Wittenman, experimental test engineer Charles Williams, and development technician Ernest Amstutz.

Test cell viewing by TV also has been studied by Wright Aeronautical. Wright conducted studies of TV view size in color for complete operation of its Wood-Ridge plant a number of years ago, but found television not reported and has been entirely satisfactory at that time.

PRODUCTION BRIEFING

• **Northrup Aircraft, Inc.**, Hawthorne, Calif., plans to put in new flight testing facilities at Palmdale Airport, Calif., at a cost of more than \$2.5 million. The new facilities will employ approximately 700.

• **Western Air Industries, Harvard, Calif.**, is putting up a \$125,000 new store addition to its facilities. The firm recently delivered 300A Douglas AD Skyraider center wing assembly. It has a \$10-million backlog.

• **Parsons Industries, Inc.**, maker of Fluid-Tight self-sealing seats, has

moved to a new 5,000-sq-ft plant at 501 North Point Ave., Hawthorne, Calif., near the municipal airport.

• **Sales Aircraft Co.'s** new 100,000-sq-ft Waco, Iowa, plant is undergoing a \$2-million expansion. Added will be 150,000 sq ft of manufacturing space and 60,000 sq ft of office and engine repair facilities. Plans also include the removal of an engine area, including assembly for new DeWitt JST and Allison J71.

• **General Electric Co.'s** Silicone Products Dept. is moving new operations facilities at 427 W. Erie Blvd., Chicago, to provide better production service.

• **Boving Aerospace Co.**, Seattle, has scheduled its new production winging schedule by next hour (November 1964, p. 45). Company says the shift would cause hardship for some aircraft operators.

• **Lockheed Aircraft Corp.** has awarded \$1.2 million in contracts for construction of three factory buildings at the USAF jet test center, Palmdale, Calif. Work is to be completed by mid-1965.

• **Electronic Regulatory Corp.**, Norwalk, Conn., which makes Reguplex devices for electrical and electronic industries, is putting up a 2,000-sq-ft addition to its present plant. An auxiliary power supply is being installed to safeguard against failure of outside power.

• **G. M. Giannini & Co., Inc.**, Pasadena, Calif., maker of screw-conveyors and computer components, has formed a European subsidiary, Giannini Italiana S.p.A., Alberto da Giannini 15, Milan, Italy. The subsidiary will provide basic equipment for distribution and marketing of the parent firm's products abroad and maintain research experimental shop facilities for developing new extra items.

• **Magnetics Corp.** has completed all its operations under one roof in a new 75,000-sq-ft plant recently opened at 1515 East Lansing, Ann Arbor, Mich. The new facility is nearly twice the size of the previous installation.

• **Kaiser-Bohrer Textile Corp.**, New York, has installed all parts and goods of Avonair Engineering Corp., Queens, N. Y. The company will be known as Avonair-Kaiser-Bohrer, Inc., and operate as separate divisions. Avonair is producing rayon and electronic dial dye systems and other devices. Leo A. Weiss, ARCA's president, retains this position with the new firm and Jacob Grossman, president of Kaiser-Bohrer Textile, is chairman of the executive committee.

G. M. GIANNINI & CO., INC.

Pasadena, California, and East Orange, New Jersey

manufacturers of components for servo mechanisms and computers, has recently established a subsidiary with headquarters in Milano, Italy, where the following activities will be performed:

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LONG PRODUCTION LINE

Hughes Aircraft Co. Accents the New

Young management, not bound by precedent, is willing to try novel ways and finds many of them pay off.

By Philip Klus

Culver City, Calif.—There is a fresh new approach and a willingness to try the new at Hughes Aircraft Co. with the result being quality costs. The tangible evidence comes in the form of the novel manufacturing techniques employed throughout the plant, with but not plant where Hughes builds its complex interceptive fire control systems.

Last tangible but more the less pervasive, are company policies and philosophies expounded by Avionics West by some of the top men at Hughes Aircraft.

For example, RAC does not limit the use of automation techniques to the design of its fire control system and aircraft radar. The techniques of "float loops" and "floatback" are applied solely to the organization of Hughes' manufacturing and engineering operations.

One manufacturing company practice is to bring seasoned field engineers back to Culver City and put them into design and development engineering groups.

For complex and intricate systems assemblies at Hughes' huge Culver City, Calif., plant depends on controlled flow of parts and sub-assemblies.

In the way field engineers can apply their knowledge of field usage problems to new equipment design.

An interesting Hughes philosophy is the measured company policy of separating contributions of outstanding individual creatable workers with pay grade and salary equal to those who hold technical administration positions.

► **The Reason:** The book and exposure throughout at RAC is a product of several factors.

- **No precedent.** Corporate experience, which naturally shapes a company's operations in the pattern of the past, didn't exist at RAC (radar, air, electronics and large scale production) were concerned.
- **Build management.** The young management team which showed Hughes packed to run his company, since working and right to try new ideas.
- **Source of ideas.** The scientific and production people at Hughes had come from a combination of U. S. industry, giving RAC a combination of U. S. industrial know-how. Cost reduction of this kind has at Hughes is now producing new ideas.
- **Unconventional.** Multidisciplinary flow

and Hughes provided RAC with the dollars needed to try out its ideas.

► **Shows Outside Influence—Hughes' operations show the influence of the "industrial flow system" of some of its roots. The automated assembly and sub-assembly techniques mimic of the automotive industry. The reason went to RAC's research and development into assemblies that in the search for of Bell Telephone Co and General Electric. Some of the new ideas in between engineering and management had their origin in the Harvard School of Business Administration.**

It would be unfair to suggest that Hughes merely borrowed ideas from others. It has pioneered techniques that have already brought old ideas into new manufacturing in Culver City for a long time.

Tight Production Loop—Long, phase loops in a new system can cause instability. An equivalent "phase lag" in manufacturing operations results in high production and low output. This equivalent phase lag is the signal between the system that a machine or tool first began to slip out of tolerance and the time that the resulting defective parts are last detected at a distance inspection station and turned back to the assembling machine or operator.



PRECISION

superior of fire-control parts on the shop floor



NEW TWIST

in making electrical housings in satellite control board that cuts exposed production time sharply



INVENTORY

control calls for sharp thinking, is typical interceptive fire control system can about 15,000 parts.

Hughes has lightened the load by placing expensive gages and test fixtures on the shop floor so that precision-machine operators can inspect their work as soon as they take it off their "machines." "You have to discover your troubles at the time you're making them," is the way that R. B. Perlman puts it. Perlman is plant manager of the Electronic Manufacturing division which tests and inspects fire control systems.

Perlman disagrees sharply with those in industry who are afraid to give per-

mission gages to machine operators for fear they will damage or misadjust them. RAC maintains gage accuracy by removing all gages at the end of each shift and checking them against master. After the gages are sealed and then handed out to the same shift on the following day, according to Perlman. On-the-spot inspection and a standard quality control program, both introduced about a year ago, have cut overall scrapage to around 10%, decrease of total machine shop output, Perlman reports.



SIP BORING

machine is one of foreign tools used.

► **Tooling for Precision—**"We learned the hard way that old tools that you can't expect quality into a product, you have to build it in," Perlman says. Some of the tooling required to fabricate today and computer parts must be designed for tolerances of 20-mil-inches or less.

Many of the Hughes machine tools have been imported from Switzerland and Germany and include big hydraulic jig boring and drilling machines, Tiers automatic screw machines and Broom jig grinders. Many of the machines are



Oddly enough, the metal fabricating process first used to produce carburetors during World War II blemishes. The tiny power blades in the turbo superchargers of high-flying B-17s and B-29s that provided extra speed and longer range were produced from high-tensile iron alloys by the unique Microcast Process.

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specifically back to Hughes specifications, it becomes proof.

Parthout pointed out a Feltous Eee pitch gear shown, built by selective fit methods and meeting special specs, for which Hughes paid a 25% premium. To produce the superquality, which Hughes made, the premium gear sheet is rejected and only half its rated speed, Parthout explained.

► **Insulation.** Feedback-Hughes has copied the same high-control, closed-loop philosophy to the assembly lines where major components are assembled and used.

"There is a feedback station at the end of each sub-assembly line. When a fault is not shown up, the inspector takes it away more than a few steps from the work station where the error was made. Rapid feedback of its location directly to its source quickly cleans up the trouble, Parthout says.

The assembly lines are built in a variety of lengths from a single standard modular type, units designed by Hughes Aircraft. The work stations can be provided with either a flat top working surface, or a track to accommodate flat wheel dollies which carry the work from one station to the next. The dollies can be equipped with small sets of thrust blocks to accommodate a wide variety of work units and stages.

Radar antennas and receiver transmitters are assembled in large frames suspended from an overhead track.

► **Control to Rapid Change.** Hughes has geared its assembly lines to handle the frequent change changes and improve units which experience stress as inherent in the first testing for combat.

The responsiveness of these changes is what Parthout calls "foot-type changes—minor circuit changes that can usually be introduced in the line less than eight hours after the need first arises.

► **Scheduling and Bookkeeping.** Apparently 15,000 parts go into an aircraft engine control system and then comes a serious flow and scheduling problem.

The Hughes solution is to set up an accumulation area immediately adjacent to the assembly line. A two-to-three week supply of every part needed in a particular line is stored here, in individual bins and the assembly line is replenished weekly from the accumulation area. The area is then replenished as one stock from general inventories is needed.

As a result of its close association with GM, HMC achieves a five-fold inventory reduction in a year.

Keeping structural tub on 15,000 parts could be a bookkeeping effort, but it isn't at Hughes. An analysis showed that about 50% of these parts represented only 10% of the total material costs. So Hughes tests any part coating

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one dollar or less or "just stick" much like most manufacturers treat nuts, bolts, and washers. The 15% of the parts that cost more than two dollars are handled in a controlled manner and reworked as needed.

► **Easing Production Headaches**—Putting a newly developed system into production normally produces lots of headaches in engineering and manufacturing departments. Manufacturing people usually ask for many changes in design to make the equipment easier to produce. These changes frequently hurt system performance, and the development engineers must be called in to redesign circuits to get performance back up to specifications.

Hughes says that problems by means of a low rate pilot production line operated in its research and development lab pass to full-scale production.

The pilot line gives production people an opportunity to solve the fabrication problems, suggest design changes, and get familiar with the new system. Lab engineers get a chance to make design changes without the disruption that would occur if tried on full-scale production.

As pilot production tapers off, the manufacturing people on loan to the lab return to the manufacturing division with knowledge of the production job they are soon to tackle and some of the problems they'll face.

► **Speed-Up**—Even before the pilot run is complete and the final design is frozen, Hughes has begun to release drawings to its manufacturing division for procurement of parts and the building of special tooling and equipment.

This is a calculated risk and results in some scrapage. However, HMC officials say that it reduces by many months the long gestation period otherwise required to develop and put new complex systems into production.

Hughes also speeds up flight testing of experimental systems by cutting error time 20 percent, many of them jets, from a runway adjoining the R & D labs. (On occasion, Hughes engineers have literally picked up laboratory benches and moved them and their precious inventory into a C-47, using precious taxiway time. Dr. R. F. Johnson told Avionics Week: Johnson is associate director of the R & D lab. When engineers finish a device, the surplus can be tried into the lab yard and the technical experts from the lab are immediately available for trouble-shooting.

► **R & D Lab**—The fire control system built by the Electronic Manufacturing division here, and the Falcon (see story) usually to be (or being) built at the Tucson, Ariz., missile plant, were developed and designed in the 400-room Research and Development laboratories. Dr. Don E. Woodbridge,

What Hughes Aircraft Research and



DIGITAL COMPUTER

the advanced intercepts fire control system has information fed into its magnetic memory drum.



MISSILE CHARACTERISTICS

are investigated in the system at the proving and laboratory.



EXPERIMENTAL SHOP

shows a lot of special cutting equipment and development engineers in their work.

Development Engineers Are Doing



SIMULATOR 'FLIES'

for control problem in laboratory to work out the basis in development of advanced types of equipment.



WRITING SPEED

of an experimental cathode ray storage tube is used to measure the speed of an electron tube laboratory.



FIRE CONTROL

system components for South American Airlines F106 have got engineering check in the laboratory.

Joseph of Bell Telephone Labs, is vice president and director of the lab. Its function is not as unusual.

The scope of the division's activities is broader than its name suggests. In addition to research and development, the R & D lab has responsibility for production design and system engineering. Until recently, field engineering was also an R & D lab responsibility but it has now been made a separate company division.

The lab operates on a semi-autonomous basis. They have their own personnel and purchasing departments as well as the large model shop to produce experimental and pilot line models.

The two largest technical groups within the R & D lab might be called "weapon systems" groups. The guided missile lab is responsible for the complete development and design of the Falcon, the more lab has similar responsibilities for intercept fire control systems. These other laboratories—the Advanced Electronics, Electron Tube, and the newly formed Macross—push out the frontiers of knowledge in their fields, develop new designs, and support the weapon systems groups.

► **Weapon Systems Lab**—The missile lab is sub-divided and organized on the basis of professional skills (i.e., mechanical, propulsion, electronics, controls, etc.), the Johnson says.

In the fire control lab, where several different systems are under development at any one time, a project type of organization is used, Johnson says. Teams of men with backgrounds in mechanical, electronic, and other skills are assembled to work on specific fire control system projects.

► **Research Lab**—Hughes states that major improvements in missile and fire control performance frequently come from basic or fundamental research. That explains the existence of HMC's electron tube, advanced electronics, and microwave laboratories. But there are other areas.

The advanced nature of HMC's work means that its work is frequently years ahead of component development by outside component manufacturers. Then too, missile and fire control needs are sometimes so specialized, and the market so limited (by comparison to radio-TV), that manufacturers are not willing to develop suitable devices or components.

► **Electron Tube Lab** is currently investigating "cathode-ray amplifiers," a comparatively new technique for amplifying microwave energy through the interaction of electron streams with electric fields induced in surrounding insulating tube walls. The lab is also working to reduce that delay and improve the efficiency of traveling wave tubes to permit their use as broadband oscillators and mixers in radar and missile



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guidance. This laboratory is putting considerable effort into developing reliable air tubes to provide better radar penetration in aircraft for control systems.

•Advanced Electronic lab, activities are based in scope and include research in auto-conductors, microwave data processing, communication systems, magnetic components, and sub-miniaturization techniques.

One notable program is the development of an airborne digital computer which can be used for navigation, fire control, and other aerial "problems." The object is to design a single universal computer which can replace current old type analog computers such of which must be tailored to one specific task. (Advantages of airborne digital computers were described in *Aeronautics* News, Dec. 28, 1952, p. 27.)

•Microwave lab, recently organized, performs basic investigations on areas where propagation characteristics and new microwave techniques for use in remote guidance and fire control systems.

•Transforming Knowledge—To supplement normal channels for transmitting learn how from the research lab to the various labs, Hughes recently has planned personnel learn how lab to transmit its laboratory reports. It will be a group of concentration specialists from the advanced electronics lab who were assigned to handle and fire control lab in order to pass along their accumulated knowledge.

The laboratory admits that it is some time before it gets the systems lab to design these specialists to return to their home lab.

•Work in Commercial Fields—The R & D lab is currently studying the automatic data handling needs of radar, fuel, thermal and mechanical control panels.

The object is to design a line of equipment suitable for their use, yet sufficiently versatile to find wide application.

Hughes officials think there is a bright future ahead for the micro-mechanics and digital computer knowledge gained in reliable and fire control work.

The generation design which H&C is currently marketing successfully was developed in the R & D lab. Work on precision navigation is in its early stages.

•Role of Field Engineering—Hughes places its field engineering department in a broad and important role at company headquarters here in addition to the customary role in the field. Local activities include:

- Feedback of information on equipment performance in the field to appropriate design groups
- Influencing design of test equipment

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for maintenance in the field.
• **Warning:** technical manuals and in-
struction books.
• **Conducting** technical schools to train
industry personnel in the use and main-
tenance of HMC equipment.
• **Preparation** of modification instruc-
tions and field modification kits.
HMC field engineers also perform the
usual technical issues at various main-
tenance plants where Hughes equip-
ment is being installed and it is widely
thought that the world where Hughes
equipment is used is best.
• **Emphasis on Feedback:** E. M. Boy-
kin, who heads HMC's Field Service
and Support Division, places great im-
portance on the information feedback
role of his group. A Hughes field engi-
neer must have a degree in electrical
engineering or physics, Boykin says, be-
cause most are needed who are more
than technicians.

Hughes field engineers must have the
technical savvy to pinpoint the causes
of equipment failure and to recom-
mend design changes for improved per-
formance. In some cases, field engineer-
ing is transferred back to the R & D lab
and assigned to preliminary design
groups where their field experience can
be used to design the design of new
equipment, Boykin says.

Hughes doesn't allow field reports on
equipment failures to languish in the
field engineering department. Copies
are quickly made and distributed to the
appropriate engineering, manufacturing
and quality control sections for ac-
tion.

When a product is inspected from
an outside reader shows up too the
quality, as these failures reports, the
reader's name must be dropped from
an approved reader list. This prevents
other groups within HMC from so-
lomonizing using a component that
exhibits his views to be satisfac-
tory.

Within the past several months,
Hughes has set up a system to log
component failures as IBM cards to
provide its design groups with easy ac-
cess to statistical information on the
reliability of individual components.
If a development engineer has a choice
of using either of two tube types in a
particular circuit and wants to know
which type has the better field service
record, he can turn to the IBM cards
for a quick and quantitative answer to
his question.

• **Unusual Phenomena:** "The number
one objective of our Field Test Equip-
ment Division is to make extensive field
test equipment necessary," Boykin
told Avionics Week. Field engineers
work with his section of the R & D lab
during the design of the visual and
acoustic equipment to detect errors of
incorporating self-checking or built-in

test circuits while the design is still
fluid. This philosophy and practice can
greatly reduce the size and complexity
of external test equipment, Boykin
points out.

In the F-85D or F-41C, a remote
sense unit of the radio operator can
give his Hughes test control system a
quick, big picture or a tight check on
any a built-in tester, Boykin says. By
pressing a selector switch to each of
15 different positions, the operator can
check a like number of critical system
voltage (A, moving coil, provided by
the selector switch, about the voltage
that should be obtained in each
switch position.

In the F-85D, which has an sepa-
rate radio operator, this built-in tester is
mounted in the fuselage and is acce-
ssible only on the ground.
• **Interior Test Equipment:** Maj. Gen.
Donald L. Pett, vice commander of
the SAF Air Research and Develop-
ment Command, recently made a plea
to the aviation industry to get its field
testers out on time (Avionics Week
Apr. 27, p. 64).

The difficulty is this. If testers are
dropped early in the program, they are
inexplicably substituted by automatic
changes in the equipment which they
are designed to test. If the tester de-
sign is delayed until the equipment de-
sign is frozen, the testers will be for
equipment by a test or more.

The Hughes solution is to build pre-
liminary field testers to hold the fort



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Controllable inductor, called the Type
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ing to its manufacturer. Maximum induc-
tance of 30 ohms at zero control current can
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during the first few months that the equipment is out in the field. The test team is started after the equipment design is frozen.

Coping With Complexity—The Hughes has control systems used in the F-80D, F94C and F-105D as complex, even to an avionic observer. Each system consists of some 35 separate "black boxes" comprising over 200 vacuum tubes and thousands of mechanical parts. The Air Force had learned to expect avionic complexity in its bombers, but it must now learn to cope with some possible avionic complexity in its interceptors.

HAC's field engineering group has scheduled some 700 Air Force and Navy, for control specialists in a series of 25-week courses. Some of this, from technical training commands, have returned to their units to set up schools for working-level technicians. Others have returned to operating air groups to set up airborne maintenance facilities.

Hughes doesn't underestimate the problem the military faces in keeping its new fire control equipment operating. A HAC study indicates that an average of 14 military helicopters per interceptor will be needed. If the military can provide this amount, more power is adequate quantity, HAC officials confidently predict that the equipment will be operational when needed. They cite, for example, the results of experimental flight tests on a control HAC system at Eglin AFB, Fla. Given adequate maintenance, this system yielded up 34 missions without failure, a HAC official says.



New Narco DME

In the midst of growing interest in distance measuring equipment, Narco Aeromation Corp. (Narco) of Andover, Pa., has announced its entry in the DME field. The Narco unit, which weighs 33 lb., is designed for executive and corporate-type use, as well as for airline use.

The new DME uses a piston-type indicator with a 1/2-200-in. range scale that can be switched to a 0-200 scale for approach. Narco cites recent flight tests have shown the DME



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to have an error of less than 2% on the reverse scale and less than one-half scale error on the approach scale.

◆Design Highlights—The Navco DME is mounted in a built-in rack and requires no external air supply. Transmitter frequency is crystal controlled and pulse timing is obtained from magnetron-driven delay lines. Navco was the DME in the field with an approach scale as low as 10 miles. The new DME was planned with type of construction and is available with either standard or basic ruggedized.

A special flashing light may be used for positive identification of a transponder associated with a known VOR.

The Navco set was developed to specifications prepared by the Civil Aeronautics Administration under a project sponsored by the Air Navigation Development Board. Navco says its DME will be available later this year.

FILTER CENTER

◆Autopilot Problems on F-50D—The warning came that North American Aviation introduced in the F-50D the valve gear control system to make the complex less responsive to slight pilot miscontrol. This caused autopilot stability problems. The valve repeatedly hits down stop which upset the previous airplane's autopilot compatibility.

◆Western Link Program—Seventeen technical sessions and approximately 37 technical papers have been scheduled for the Western Electronic Show and Convention to be held Aug. 19-23 in San Francisco. The program will include two sessions each on electronic propagation, electronic devices, circuits and computers. There will be one session each on airborne electronics, microwave techniques, sensors, instrumentation, transmission, transmission and receiver reliability measurements.

◆Making Jets a Better Target—Lockheed feels that the jet fighters which were so elusive targets for its earlier equipped F-94C are extremely difficult to spot on the F-94C radar scope, all-around report. To help the problem, Lockheed is experimenting with radar transponder beacons and corner reflectors being fitted to the top sides of its target planes to strengthen their radar return.

◆UIHF Troubles Found—The military, which is switching its airborne communications to the UIHF region, is still plagued by propagation troubles when high-powered antennas are used. Observers report that propagation is most vital at times, only to be followed by severe and unexplained fading. —FK



GIANT ALUMINUM FORGINGS SPEED PRODUCTION OF McDONNELL DEMON

A team of engineers from Alcoa and McDonnell Aircraft Corporation developed the structure known as the F3H-1 Demon. Two 350-pound Alcoa forgings attach the wings to the fuselage, "carrying-through" the tremendous loads imposed by high-speed flight.

Earlier designs embodied a series of complex assemblies for this spar section. Fabrication was time-consuming and expensive... produced overweight spar sections. The Alcoa forgings save weight, time and cost.

One of the first aviation applications produced on this Alcoa spec-

and 15,000-ton press, McDonnell's 350-pound forgings join the wing to similar forgings for other aircraft manufacturers. Three size of the press permits for larger and more intricate forgings to be produced—with complete set frame assemblies formed in a single cast.

For additional information on this press... or any of Alcoa's facilities, contact your nearest Alcoa sales office—listed under "Aluminum" in your telephone directory—or write Alcoa Aluminum Company of America, 1800-T Alcoa Building, Pittsburgh 19, Pennsylvania.

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75ST HI-SHEAR rivets combine "head popping" and wrinkles in skin panels more effectively than 2461 OD rivets. Combining higher tensile strength and close tolerance heads, the 75ST HI-SHEAR pins and higher shear and tension allowances reduce drag problems and improve surface finishness.



HS25 sets in skin panels by hand gun. It is designed to cut through thickness of 251 or more. This process is accomplished with one finished work.



HS23 is used to install rivets into skin panels. It is designed to cut through thickness of 231 or more. This process is accomplished with one finished work.



HS26 sets in skin panels by hand gun. It is designed to cut through thickness of 261 or more. This process is accomplished with one finished work.

• 22 of 75 SHEARS drive in 1/2 in. skin of 251 rivets most of skin. 1/2 in. skin of 251 rivets most of skin. 1/2 in. skin of 251 rivets most of skin.

• 75ST HI-SHEAR sets the wing standard 75 in. skin of 251 rivets most of skin. 1/2 in. skin of 251 rivets most of skin. 1/2 in. skin of 251 rivets most of skin.

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EQUIPMENT

Runway Light Nears CAA Ideal

A new type of variable-intensity airport runway light, developed by Line Material Co., is under service test at Minuteman's General Mitchell Airport and is close to meeting the CAA standards. Adaptability, responsiveness led down a test up for the "perfect" runway light, CAA officials have announced.

The tests will continue several months under actual operating conditions at the airport where a complete revision of the lights is to be installed.

Pilots of seven airlines, holding at Minuteman during a recent low visibility period, proved the effectiveness of the new installation.

• **How It Works**—It works like this: As visibility becomes low, the traffic controller turns up the intensity of the light. As intensity increases, the angle of the beam begins to open as it is changed so that the brighter light is pointed down the runway, more directly toward the approaching plane. This change in "beam" is accomplished automatically without the use of motion.

CAA credits Coy Prance and Mark Gilmore, CAA lighting engineers, and Leslie Vignar and Bernard Bennett of CAA Office of Airports, with development of the requirements for this type of typical transport planes in good and bad weather approaches. These requirements were published last year in CAA Technical Development Report No. 178.

At that time, Line Material Co., Milwaukee, had its new light in development independently.

Measurements of the light given by the tests at 75 ST light show that approaching aircraft that the light is within 10% of meeting the theoretical perfect conditions. Only 3.5% of the deficiency is in a critical angle. It is expected that with only slight modifications it will meet the final requirements.

• **Advantages**—As for ground operation of the lights, L.M.C. cites three advantages.

• **Reliability** and **moving control** are considered as a single operation.

• **Simple design**, resulting in low maintenance and maintenance costs and high reliability. Elements have been selected as an electronic system simple.

• **Lower mounting height** than most other types. Lamp is not seated on top of the mounting post but suspends from its side. Spherical shape meets vision barrier.



LINE MATERIAL's new runway light.

• **Color filter** are not required.

• **Higher wattages** than most types in use.

• **Thermostatic Principle**—The new beam control system is based on the principle of thermal expansion and contraction of dissimilar metals. A helical is metallic and expands heat generated by the lamp to actuate the change in beam angle of the light. This simple mechanism has a maximum of parts and maximum efficiency.

The light is a 120 v., 900 w., multi-lamp type, requiring installation of an underground multiple distribution system, including cable and transformers.

• **Double Power**—CAA says the new Line Material lights show in tests that they meet approximately the 200,000 candlepower peak intensity that the company has specified. The CAA ideal specifications call for only 100,000 candlepower in the main beam. The light is designed for maximum utilization of excess beams for circling guidance.

Minuteman Field was chosen for the installation because it already had an underground installation for multiple light in place at the runway. The lights are spaced 200 ft apart for the last 1,000 ft of the runway to emphasize the touchdown area, 200 ft apart for the rest of the way. The installation requires 140 lights.

"Minuteman has got what any airport to be the best lighted airport runway in the world to date," says TORC's Gilbert.

NEW AVIATION PRODUCTS



Cockpit Sun Visor

Fluorescent installation of cockpit sun visors has been made by United Air Lines.

The visors, on both sides of the cockpit, slide along horizontally to the position desired, or they can be stored in special brackets. They are made of Du Pont acrylic resin H-245, an ultra-violet-absorbing material, and are designed to cut early morning and late afternoon sun glare.

Complete kit, with left and right visors and all hardware, is supplied by Harkness Tool and Engineering Co., 1845 So. Beverly Drive, Los Angeles 25.



Pressure Regulator

A regulator for nebular radar which maintains pressure at a constant level regardless of altitude has been announced by Accessory Products Co.

The regulator employs a system of valves, one a solenoid, which are controlled by time-actuated bellows. It can compensate for leakage in excess of 200 cc./min. in pressurized radar systems. It is suitable for inlet pressure ranging

from 20 to 1,500 psi and for temperatures from -65 to 150°F.

At low temperatures, either in the regulator are heated by a thermostatically controlled element which operates on the plane's 28 v. d.c. electrical system. The unit can be supplied without heating elements where dry air is used for pressurization. The regulator operates on air or gas. It weighs two pounds and measures 7.75 in. in diameter and 3.75 in. in depth.

Accessory Products Co., 617 Pelham Drive, Whittier, Calif.

Radio Receiver Maker Sets Up Sales Pattern

Sales of low-cost Minuteman radio receiver, produced by Radio Apparatus Corp., Indianapolis, will be handled by the future under exclusive distributorship assignments with aircraft parts wholesalers, the firm says.

The line includes the AR-1 and AR-3 receivers, designed to operate within the frequency range between 100 and 140 mc. Sets are priced at \$66.50.

Eight major parts distributors have signed up, the company reports. They are: Air Associates, Inc., Chicago and Dallas area; General Aviation Supply Co., St. Louis and Houston; Don Hays Co., Memphis; Van Dusen Aircraft & Supplies, Inc., Minneapolis; Teterboro and Boston; Air Winkler, Portland and Vancouver; Air Parts, Inc., Portland; General Aviation Corp., Detroit and Aviation Supply Corp., Tampa.

Canopy Desiccant

Since heat, an improved desiccant developed by Socome-Vernon Oil Co., is being used to prevent clogging of fighter aircraft cockpit canopies.

The product, combined in a unit rate unit, distributes air between the double element of a light. The unit rate unit is developed by Socome-Vernon Oil Co., which is a clear plastic cylinder. Aluminum caps at both ends are threaded for tubing connections. The Socome-Vernon desiccant is returned by service, which are held securely but can be removed quickly without tools.

A Socome-Vernon says the desiccant unit also has been used to keep moisture out of fuel tanks, among other applications. An advantage claimed is that it does not become "runny" or sticky with moisture and can be easily washed out.

Accessory Products, 360 S. 30 St., Newark 1, N. J.

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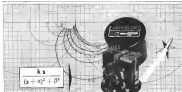
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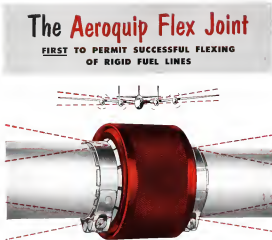
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and oils. —Chemicals Development
Co., Danvers, Mass.

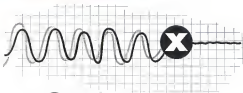


still tools . . . without precise cutting of tubes or flaring of tube ends. Titanium tools on the Hot Joint have been conducted ranging from -45° F to +140° F, from flexing, vibrating and stretching, to heating with propane and acetone, and demonstrating ultimate strength by heating. The work has been conducted at a long list laid down by the N.A.S.C. Descriptive literature is available, please write.



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AIR TRANSPORT

CAB Starts International Subsidy Cuts

- FAA Latin America Division takes \$10-million slash; Board marks four other air operations for scrutiny.
- Economic staff investigates airline expenditures and investments for high sales expenses, over-capacity.

By Lee Menden

Pan American World Airways is first airline to feel the brunt of a new Civil Aeronautics Board policy aimed at curbing the government's extraordinary regulatory activity.

The Bank's rate-making staff cut the Latin America Division back \$10 million from a normal 7% profit to about 3% for the period Apr. 5, 1980 through Dec. 31, 1981.

British Delta-CSS, TWA and Pan American's Atlantic Division are next on the list for closer scrutiny under CAB's get-tough policy. All have filed international route rate cases pending.

► **Two Critics**—The Board's economic staff, directed by Charles Barr, is pushing every expense and investment and will apply two major criteria of unreasonable expenditure.

- Drop capacity.
- High selling expense.
- **Why CAB Cost LAD?**—In the Pan American Latin America case, the Board topped \$3,356,000 from PanAm's subsidy need because the company bought more planes and flew more schedules than the Board figured were reasonably justified. As an example, the Board often flying of several planes a day on a route where one could do the job. CAB also notes average Convair utilization of only four hours a day.

On high selling expenses, the Board looked at the international operations and decided LAD sales and promotion cost were out of line. CAM says it will disqualify almost any seller's selling expense that comes to more than 1% of commercial revenue. The Board listed \$1,034,800 from FinAm and

only on that yardstick. In the Atlantic wall case with TWA and Pan American, Roen's staff proposes to allocate expenses up to 19 1/2% of company civil revenues.

• **Plasma Rate:** Of the total \$10 million CAR cut out of Pan American's business need for the four-year period, about \$5 million is lost to Pan American donors. But the company can recapture the other \$5 million through later insertions of plasma at older and facilities.



BANK: Free over-allocating subsidy to

The C&B retrenching staff plans to settle a future rate for Pan American within about two months. It will be effective from about last Jan. 1 forward, having only the past 1952 left unsettled. The Board sets future rates to yield an estimated 10% profit return on assigned total investment and/or on 11% return on the common stock equity (Avarose Wire June 15, p. 70).

• **Steady increases**—CAR began its 100-page opinion by stating, "Throughout the review period, the book-earnings ratio of LAD increased steadily." The Board adds that so far back as 1976, it "directed the investors' attention to the fact that remedial action by LAD was warranted."

The use of the final CAB cut our spread offer airlines. International carriers are now studying the options in an effort to determine how the Board's policy may affect them.

► **CAR Staff Decisions**—In most cases

rate costs, including five month's LAD charges, the CAS negotiates staff settlements directly with the unions. The Board generally approves the staff settlements, did so in the LAD case.

Working directly on mail rate issues is Bain's Susan, of Air Operations and Irving Roth, chief of the Overall Rates Division and Harry Schneider, chief of the Mail Rates Section. Bain and the Board determine overall policy, but rely heavily on Roth and Schneider.

In the Atlanta mail slot case, the coroner would not consent to turn over the staff and therefore requested full hearings. In such cases, the Board has to go to the staff and the coroner, then decide for itself. However, the detailed participation by the staff over the Board's main source for final decision.

Staff officials say that under Rios there do not happen on the money already there but derive what is their opinion is the proper rate, based on statistical analysis of the narrow sector. That is the reason the Board generally adopts something close to the rich countries' average.

NWA Re-organizes Its Management

Re-organization of Northwest Airlines management) to step up efficiency and productivity of the carrier's domestic trunkline and international services is underway. Effective Aug. 1, the airline is establishing a Continental Division with headquarters in St. Paul to handle its domestic business and an Overseas Division based in Tokyo to take care of its foreign operations.

Overall supervision and coordination of these divisions is to be handled by a systems executive office some of whose members will move from St. Paul. New York (AVIATION WEEK June 15, p. 92). Among the NWA executives who will be located in New York will be Harold S. Hines, president; James W. Munster, vice president-sales; Willy Flawie, vice president public relations; E. J. Wrenn, vice president-operations; Louis C. Glusback, vice president-program; C. L. Stewart, vice president-plan; and Dale Menchik, assistant vice president operations.

The Continental Division will be headed by Michael S. MacKey, vice president and the Ocean Division assignment is being undertaken by L. B. Kinsport as manager until appointment.

1

al a vice president to the post is made. Engineering immediately are studying the proper design and location of NWA's maintenance and overhaul facility, now located at Holbrook Field, 50 Paul. Their recommendations will be submitted by Oct. 31. Possibility of moving to Seattle or Minneapolis-St. Paul Airport was reported in *Aviation Week* June 15, p. 32.

Lofteidair Cuts Fares, Wins Heavy Loads

Lower-than-standard fares, free food, bigger luggage allowances, fast transportation and fast turn-around times helped Lofteidair win heavy loads for its new DC-4 service between New York and Hamburg, Germany.

A report from the U. S. consulate at Hamburg, released by the Transportation, Communications and Utilities Division of the Department of Commerce, indicates the Lofteidair air was very considerable trade from competing carriers whose rates are regulated by International Air Transport Assn., at which Lofteidair is not a member.

SAS, Pan-Am, Scandinavian Airlines, most severely affected by the competition, already has threatened to

leave IATA (Aviation Week, Apr. 20, p. 32) if the U. S. cannot keep an air agreement with Lofteidair's rates. However, the U. S. Lofteidair air transport agreement signed in 1945 makes no provision for price fixing.

Because it is not an IATA member, Lofteidair can charge whatever it likes at Hamburg on the New York-Roskjavik leg. Rates on the Iceland-Roskjavik route are fixed at IATA levels by an agreement the country maintains with several European governments.

Chaparral Agreements—At present, the carrier's minimum New York-Hamburg roundtrip fare is \$13 cheaper than competing tourist fares. Off-season rates are the passenger \$29.

The Icelandic airline operates under a cooperative agreement with Southern South American and Pan American Air Transport, an independent Norwegian carrier that flies its DC-4 fleet as far east as Hong Kong. Under this agreement, Lofteidair operates an alternating route with Southern's equipment; in Germany, Southern serves as the Icelandic host's ticket agent.

Competition—Lofteidair's weekly flight leaves Hamburg and Copenhagen on alternating weeks on overnight stops at Stavanger and Oslo, en route to Roskjavik the next morning. Twelve hours after leaving Roskjavik, it lands at New York. Minutes after the outboard flight leaves New York,

stops at Reykjavik and arrives back at Hamburg Wednesday morning, remaining on to Stavanger and Copenhagen the next day.

SAS has active tourist flights to New York weekly. All go through Hamburg. Pan American World Airways operates on Hamburg New York tourist flight and seven between Frankfurt and New York each week.

To compete with the bigger airlines, Lofteidair offers an allowance to refund tickets, a baggage allowance of 66 lb. as opposed to 44 lb. allowed tourist passengers on most airlines. Its transportation to and from the Hamburg Airport is free to Lofteidair passengers and scenic flights at overnight stops along the trans-Atlantic route are paid for by the airline.

Brazilian Airline Wins U. S. Route Rights

Brazilian International Airlines has won certification to fly to the U. S. and is negotiating to buy three Douglas DC-6B.

The new transporters are scheduled for delivery by April 1955. The company plans to start U. S. service routes, flying DC-6B to New York and possibly to Chicago via New Orleans.

Customs, another barrier to entry, has dropped its franchise to the U. S. because of failure to get subside.

Very many is a later contractor for Brazil U. S. routes. But the airline says its most recent for three Lockheed Super Constellation was submitted at North American service. The Super Constellation will go into coastal South American service, competing with Pan Am's Brazil Air Service and Brazilian Airlines.

Rail Losses Spur P.O.'s Airmail Drive

Higher mail rates for airmail may be another spur to Post Office Department's drive for the night to ship some service under by airmail.

This was the official conclusion of an Air-Rail-Stra-Water Transport Panel study sponsored by Commerce Department. Robert Murray, Undersecretary of Commerce for Transportation, set up the panel without his Railway-Commerce Transportation Council to lead solutions to the "national" airmail drive on passenger train operation. Air Transport Assn. participated in the study.

Air-Rail-Stra-Water-Transport Commission study of airmail and mail passenger train but last year at \$644 million. ICC estimates perhaps \$64 million of this is payable to some

phase of airmail mail service. Higher mail rates may be one source and discontinuance of some mail service possibly.

Both may further stimulate the Post Office desire to get more mail into the air.

Passenger Loss—The panel is expected to recommend dropping many small town passenger trains and stop at the major stations to lower. Many state regulatory commissions have forced railroads to maintain service that long ago ceased to pay off the road funds. Legislation is proposed to permit ICC to evaluate state bodies on the question of discontinuing uneconomic rail service.

Airmail's coach and first-class passenger rates last month are running from 1 to 12% under a year ago. The decline has been steady the past 12 months.

Branniff Pins Route Acceptance to Subsidy

Branniff International Airways and North Central Airlines reached an agreement before Civil Aeronautics Board that neither will start the new small-town route system in the Dakota area. Minnesota proposed by CAB.

The Board stated that by rejecting that Branniff serve the route, which several towns in CAB now have. Chase County's home state of North Dakota proposed new route would serve numerous intermediate towns from Fargo to Sioux Falls and then back to Sioux City.

BNP says it does not want the proposed local service routes unless it gets a subsidy. That plan attempts to avoid acceptance of the proposed service obligation upon Branniff getting a subsidy in its domestic mail rate too.

North Central asked CAB for the proposed routes at the Fargo old says it has not submitted it in the least of viewpoints of several pending route-change applications that might strengthen NCA's airmail-subsidizing local service routes. North Central plans to acquire Lake Central Airlines and/or Branniff's local Route 106.

Branniff wants to get out of Route 106 and does not want any more local routes added, unless the Board will subsidize them. Right now, the airline still is on a membership road rate of 33 cents a ton mile but is carrying routes that were subsidized before Branniff acquired them through merger with Mal-Consolidated last year.

Comments on NCA's Route 106 are in September.

Both North Central and Clark Airlines will ask CAB to transfer Route 106 to their system. A Branniff spokesman says he will not ask to

renew the old route rights on that route unless the Board grants subsidy to operate it.

CAB Names Griffith As Enforcement Chief

Civil Aeronautics Board has named Robert F. Griffith, former Delta and American Airlines executive and attorney, as new chief of the CAB Office of Enforcement. His successor Glenn Carter will resign.

A major portion of current work of the Office of Enforcement has been devoted to prosecuting unscheduled airlines for exceeding the Board's present limits on route-type passenger revenues below in independent carriers.

The enforcement chief has some discretion as to how soon and how hard to work down on alleged violators. Wilmington shippers expect seriously to protest appointment of a scheduled airline man, rather than a former local media industry to this job.

Griffith comes to CAB from the Office of Price Stabilization, where he has been an attorney-advisor since 1951. Prior to that, he was assistant to the president of Delta Air Lines (1948-50) and secretary and assistant company manager of American (1948-45).

Correction

Civil Aeronautics Board chairman, in recommending approval of the Eastern-Golden Airline merger agreement, also suggested a National Board Airlines merger—not National Northeast as reported in *Aviation Week* (June 22, p. 39).

New York-Balboa Case Heads for Rehearing

The two-year old fight over what airlines may conduct for migration New York-Balboa. Afterward through several years of correspondence will set for the full Civil Aeronautics Board review requested by the President.

The White House asked the Board to expedite taking any evidence, but Pan American World Airways and Eastern Air Lines refused to waive full procedural rights of publishing conference (Aviation Week June 8, p. 10).

Their return may face a complete rehearing of the case.

Washington's interests are local defense in 1954 at the earliest. The controversial case got into trouble more than a year ago when CAB rejected an FAA-PAA exchange on the grounds it would get the strong interest against a worker resolution of National Airlines and Branniff International Airways.

President Truman eventually rejected the Board decision. CAB reconsidered that since the national evidence was taken, National and Branniff have grown and now are able to stand up to the FAA-PAA combination.

Mr. Boarder and the decision back to the Board again, asking speedy updating of evidence given and save the hearings, which were held two years ago.

Eastern and Pan American claimed that since the national evidence was taken, National and Branniff have grown and now are able to stand up to the FAA-PAA combination.



MOVING TICKET OFFICE

Mobile ticket office for go-looking for customers have been put on the streets of Los Angeles and San Francisco by Trans World Airlines. Passenger tickets in any point served by the airline can be sold from these moving sales centers, located by General Motors. Work involved in moving this unit, they will be able to go wherever the car is, or follow established routes through outlying districts on a regular

schedule. Aside from auto housing, TWA hopes the plan will help solve its own ticket problem at departure time by fully processing passengers when they make their own reservations. Six people can be seated in the mobile unit. It will be used for delivery of tickets on reservation previously made by telephone. The scheme was tested by Trans World, TWA also representative in Los Angeles.



100-SEAT DC-4

Southwest Airlines presented carrying 100 passengers in a DC-4 flight student hotel last Monday. The airline is the 100 or Flying Tiger Line service. This high-density arrangement, owned by South American Co., is designed for passengers who are "not too busy to sleep." The installation is a safe and comfortable. Flying Tiger and

Southwest said. CAB showed it after months had shown passengers could share the plane last Monday. The airline is the 100 or Flying Tiger Line service. This high-density arrangement, owned by South American Co., is designed for passengers who are "not too busy to sleep." The installation is a safe and comfortable. Flying Tiger and



DOUGLAS DC-6C is now fitted out for dual passenger-cargo role. Movable bulkhead can be located at any of four stations

Douglas DC-6C

- Convertible cargo-coach version offered airlines.
- Movable bulkhead allows varying dual-type loads.

Douglas Aircraft Co., Santa Monica, revealed a new convertible cargo-coach plane is its DC-6C series, the DC-6C, designed for flexibility of interior configuration to handle special mixed passenger-cargo needs. No firm orders have been disclosed.

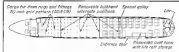
Designed around the basic structure and components of the DC-6A, the DC-6C features the new convertible bulkhead that can be moved from a coach configuration carrying 76 passengers and baggage plus 2,400 lb. cargo to an interior carrying nearly 13 tons of cargo.

- Features—Facilitating the conversion are such special design features as:
 - Lightweight seats which fold up against the wall for the storage space, protecting the window and side wall against cargo damage.
 - Movable bulkhead which can separate passengers from cargo at any one of four stations, allowing variation in cargo and passenger load factors.
 - Lightweight folding lockers, which fold into ceiling when plane is used for cargo.
 - Food buffet and rest rooms which can be removed during conversion.

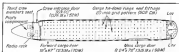
• Cabin lining of tough but non-impervious laminated Fiberglas panels in both configurations.

- Cabin floor features exclusive carpeting protected by concealed with movable bulkhead. Dividing points, cargo tie-downs, cargo bars, a 39-in. pit between cargo and cabin floor, floor is removable prior to use in leveling cabin.
- Large cargo doors front and aft.

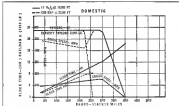
The DC-6C will have a cruising speed of 535 mph., and will take off at sea level from a 6,500-ft. runway at maximum takeoff weight of 307,000 lb., the manufacturer states.



DOUGLAS DC-6C interior configurations is detailed in above side and plan views.



ALL-CARGO DC-6C ready to take 13-ton freight load. Seats fold against cabin walls.



PAYLOAD RANGE PERFORMANCE plotted on this graph is for domestic version carrying 15 passengers and baggage plus 15,750 lb. cargo. Loading weight is 36,000 lb.

ICAO Fight

- U. S. wants to limit goals, trim \$2.8-million budget.
- Battle shapes up over unasked foreign rights.

(McGraw-Hill World News)

Brighton, England—The long arm of the Eisenhower Administration reached into the Channel-side resort this week and the International Civil Aviation Organization got a warning to pull in its horns.

Addressing the seventh annual ICAO assembly, Robert Murray, U. S. Undersecretary of Commerce for Transportation, claimed "ICAO's goals must be achieved with substantially less of a budget." We should ask ourselves, "Is this or that project really a job for ICAO?" Is it worthwhile? Specifically, Murray told American Airlines: "We're now in the area that ICAO is kept out of fields which are the rightful province of industry and aviation."

• **ICAO Seed Satchel**—The Geneva-based Undersecretary came to the right place at the right time, for this session of the United Nations' specialized agency for civil aviation is concerned almost solely with the question "Where do we go from here?" The seed satchel will go as far as most of these weeks of committee meetings.

"To act last night across Mexico brought a house of 14 experts and four others on—far and away the biggest of the 11 national delegations represented but 'each hell on his own'."

Included were Civil Aeronautics Board chairman Oswald Ross, J. Paul Rogers, head of State Department's Transport & Communications Div., and Harold A. Jones, former CAB member and very likely the next permanent U. S. member of the ICAO Council of members—Ben Alden P. A. Smith.

• **U. S. Fight**—At the assembly, leaders in the United States and administrative committees, it was obvious that the U. S. has much opposition in its drive to curtail ICAO's activities.

Despite battles are slated for the economic committee which assigns work to ICAO's Air Transport Committee. It is where the U. S. delegates want to head off requests through forward by other nations.

• **National Tension**—One target U. S. delegates have is an ICAO proposal to convene a conference this year to discuss measures that might be taken to adjust seasonal rights of non-scheduled operators in the international field.

This idea is backed strongly by the Dutch and Belgium, both KLM Royal Dutch Airlines and Belgium Airlines require similar earnings from scheduled operations. They were notified to carriers to have more freedom to land and stop over in many countries. Most now require special permission for each scheduled flight.

The U. S., achieving considerable embarrassment in this matter, will oppose the idea as the grounds there is an agreement as to what activity it means to be "scheduled" or "transport operation."

• **Big Goals**—A body passed an ICAO agenda in the question of a multilateral agreement on commercial rights of scheduled operators. This still looks a long way off.

"Further progress on this matter," says an ICAO report, "will involve consideration of certain important related issues such as the avoidance of severe competition, the achievement of the opportunity for all, and the raising of competition on the air transport field." These big goals are included in the ICAO charter. As a practical matter, they have defied detailed agreement so far.

Since U. S. delegates believe this is a good place to start discussing ICAO's aims, they are in the lead. U. S. and Western ICAO's permanent president "There are special reasons for thinking of the possibility of finding new types of work in the commercial field." He pointed out that the Council of Europe has asked ICAO to call a conference "to study the possibilities of combining European transport through an extension of ICAO's permanent members."

The ICAO secretary also hopes the economic committee will make an investigation into the charges for airport use and for terminal facilities. The current Resolution-14 addition to existing law on the use of U. S. delegates on ICAO's technical committee has been a sharp eye on the ICAO.

Civil Aviation was scheduled to propose an agreement by which nations designed to streamline ICAO's personnel and equipment. The U. S. is afraid the resolution may be prepared for the last time of its annual assembly. It is so afraid that it could mean almost nothing.

The British Ministry of Civil Aviation has been ICAO very strongly and obviously, kept working to persuade the governments to follow performance standards on their lines. But there are some moves in this chess match, and the current one doesn't look to be very successful.

• **Budget Battle**—ICAO's Administrative Committee is set to begin its work on the budget. This year it is

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stated to require \$2.8 million, virtually the same as last year. In addition, the organization estimates more than \$450,000 from various sources. Of this the U. S. gets up less than 25%. All in all, the budget is modest by international standards and it will be difficult for the U. S. delegates to push through any major cuts.

In addition to its own budget, ICAD allocates this year slightly more than \$1 million in bilateral assistance granted by the United Nations Technical Assistance Agency. In the past, 26 countries have received such assistance help of one form or another from ICAD.

By and large, the money is spent to finance:

- Teams of experts sent to conduct assessments on all phases of civil aviation from international administration to airline cost accounting.
- Fellowships to allow ICAD members to study in other countries.
- Broad courses covering all the needs for airports and aviation infrastructure on behalf of Afghanistan and Thailand.

One thing the delegates seemed generally agreed on was desirability of De Vries' warning as president of ICAD. While promising to revise the proposals of poor health, he probably will be persuaded to stay on for a

while, though probably not for another three years more.

The assembly elected Sir Frederick Tyman, British representative, as president of the seventh session. Vice president elected: Ben W. P. Butler, The Netherlands. IR R. D. Footscott, Brazil; J. Paul Bremner, U.S. and Lakshmi Chandra Jain, India.

—NMAC

CAA Cool to ATA Re-organization Plan

Top Civil Aeronautics Administration officials but would forecast a mixed reception for the 10-point CAA reorganization program Air Transport Association has recommended to the Department of Commerce Robert H. Morris, despite reports of its broad acceptance.

There is also considerable disquieting the Office of Aviation Safety and keeping its activities into a more efficient Aircraft Engineering and Maintenance Division. Neither does it appear likely that the maintenance organization will be retained since its aircraft engineering, although most aviation industry people agree engineering should stand maintenance. Civil Service and labor groups to have emerged both these proposals.

Elimination of Bureau in the North Region and reassignment of its activities to the combined Western Region of the U. S. Region 6 is not considered to be likely.

The recently announced regional reorganization is expected to stand.

Other proposals particularly accepted and implemented reductions in Washington general expenses of the organization for designated industry employees to implement work done by CAA agents or working area management in the CAA agents or divisions would decrease reductions with the civil and current before according to Working Area consolidating international field offices, and certifying statistical reports.

CAB ORDERS

(June 18/17)

Civil Aeronautics Board prepared to transfer eight interstate city services to Cook Airlines.

North American Airlines was forced down on its second day the Board delay enforcement action by flying more revenue flights than CAA's ruling mandated in December period. North American argued that the purpose of the national policy investigation is to solve new regulations, strong delay of enforcement of the old regulation would a new one is desired.

Vietnam Airlines was granted to fly a single roundtrip on Pacific Northern Air-

lines' Seattle-King Salmon, Alaska route because PNA did not accept the charter.

Southwest Airlines received from some local Canadian towns to find CAA disposal permits its reconsideration of certificate renewal of order.

Southwest & Western Airlines was permitted to fly between from March to New York June 24 because Pan American World Airways and Trans World Airlines submitted no bids for the charter.

Airlines' proposed service in maps when terms changed was withdrawn, saying that CAA investigation on the subject is necessary.

An Transport Association, made application was discussed from Trans Pacific and West Coast through some cases at very recent Board part the company out of certain earnings between recently by covering more revenue flights than CAA economic selection allows at the present time.

International Air Transport Association made a San Francisco Customs route assigned flight.

Trans World Airlines authorized to stop night service in Chicago, Ill., could integrate night lighting is installed.

Northwest Airlines Agency was ordered to stop advertising, said as an agency Northwest committed to a CAA round-trip order to stop stop words like "fly" (Stinson) and the name "Northwest Airlines" without "Agency, Inc." on the end.

Intercompany contracts between Dade Air Lines and Southern Airlines System, Inc., approved.

North Central Airlines got CAA to delay the flight, N. D., service rate for consultation with interest of itself Airways economic local service 100.

Northwest Airlines director, Len G. Jacques marketing relationship as president and director of Motor Products Corporation.

Canada of Alaska, Virgin Alaska, Northern Continental and Pacific Northern Airlines notified to CAA decision of "Alaska Route Verification Case."

Four American World Airways first round shipment of cargo to report at Seattle was discontinued on June 18th as CAA dropped an informal investigation by its endorsement.

Kansas City Shoppers Association is a bar on issuance of drug certificate licenses, CAA demanded prosecution from the flight from a policy investigation.

Robert Delle Co. was given permission to control of South Pacific Airlines and lease two planes to the carrier. Del's common control of Globe Winkler, Ltd., and South Pacific was approved.

Transwestern Air Lines was given permission to fly 74 members of Youth for Christ International, Inc., Oakland taken travel by for \$24,075 on Aug. 1. Pan American and Northwest declined the charter because of previous plane commitments. CAA denied PAA and Northwest protest that Transwestern should be denied permission to make the flight.

Trans World Airlines was granted approval to fly a single day of passenger from Wichita, Ariz., July 1, because the flight was booked before CAA allocated Westlow from TWA's route.



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Ralph S. Dumas

previous Jan. 25, 1949.

At that time the company was facing serious financial problems. For three consecutive years it had chafed off deficits, with a cumulative net loss of nearly \$10 million for the period.

Money was low, and everywhere in the industry was heard it questioned whether TWA could survive.

Now, more than four years later, the modest Dumas made-but non-imprint out an imposing record of accomplishments that demonstrates the substantial recovery his administration has achieved. There is a marked improvement in operations and expenditures, and a healthy morale is evident everywhere. And you recall distinctly that it was the same Dumas who was called in and put Republic Airlines Corp. on its financial feet after it was taken over from its original manager.

The Dumas record at TWA can be demonstrated in cold, but very meaningful, statistics.

For example:

For the four years ended Dec. 31, 1952, the company reported cumulative net income totaling \$38.9 million or better. While earnings provided the bulk of funds for the property buildup, considerable new money was brought into the company by various financing operations.

From February, 1949 through November 1952, in three separate stock offerings, a total of about \$65 million was added to TWA's equity funds. Then, exclusive an improvement in the capital structure resulting from conversions of a \$30-million subordinated note into common stock in August 1948.

In fairness, however, it should be noted that working capital balances were reduced from \$92 million at the 1948 record to \$19 million at Dec. 31, 1952, thus pro-

viding some \$73 million toward capital expenditures.

The funds generated by these various sources were largely applied to augment TWA's properties, primarily its aircraft fleet.

At the end of 1948 total property and equipment was shown at a net valuation of \$45.5 million, with aircraft consisting of 33 Constellations, 12 DC-4s, 64 DC-3s and five old Boeing Stearman.

Four years later this same property account came to double to \$92.5 million with a decided improvement in the aircraft fleet—comprising 68 Constellations, 10 Super Constellations, 40 Model 4-4s, and 12 Model 2-22As.

In the process a major transition has also taken place in the company's capital structure. At Dec. 31, 1948, total debt amounted to \$54.1 million, against a netted equity position of \$10.2 million, or a debt ratio of 5.4 to 1—described in financial circles as an extremely unhealthy situation.

By Mar. 31, 1953, while debt totaled \$55.9 million, equity was bolstered to \$70.5 million, making a debt ratio of almost 1 to 1, a vastly improved situation.

TWA's financial recovery is corroborated by Wall Street observers as even more remarkable in the face of the heavy debt capitalization thrust upon it by an entire company in a 1948 financing operation.

Thus, according to financial circles, created a diversified, heavy debt structure with a fine equity position which played the company during its difficult years and shielded its subsequent equipment expansion program.

For example, Wall Street people point out that TWA has had to create debt senior to that held by the insurance company. Various chattel mortgages were required to finance its postwar re-equipment program. TWA is the only carrier in its category (the "Big Four" and Pan American) which has debt of the chattel mortgage variety.

Actually, a burden has been placed on the company as a result of this past financing program by the insurance firm. The scale of debt maturities for the next few years is heavy and is covered by only a slight margin in projected cash receipts. This means that any additional equipment expansion must be provided through new financing and from earnings, and it would not surprise the financial fraternity if—with debt maturities in 1955 and 1958—a refinancing operation may be considered.

There is no doubt expressed, however, as to the ability of the Dumas management to cope with its financial and other operational problems.

TWA is aggressive and has shown a definite willing-ness to assume calculated risks to broaden its markets—its attitude that is not dissimilar to that in the major companies in the air transport industry. In becoming the largest operator of aircraft in the United States, TWA has, for example, demonstrated it has the ability to assume leadership in a highly competitive industry.

TWA's revitalized management under Ralph Dumas represents an outstanding record of achievement.

—Robert H. Wood

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